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BRITISH JUNGERMANNIÆ.



BRITISH JUNGERMANNIÆ:

BEING

A HISTORY AND DESCRIPTION,

WITH

COLORED FIGURES, OF EACH SPECIES OF THE GENUS,

AND

Microscopical Analyses of the Parts.

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TO

DAWSON TURNER, ESQ.,

MASTER OF ARTS,

FELLOW OF THE ROYAL, LINNÆAN, AND ANTIQUARIAN SOCIETIES,

&c., &c., &c.,

THE FOLLOWING SHEETS ARE DEDICATED,

AS

A TESTIMONY OF ESTEEM AND GRATITUDE,

BY HIS AFFECTIONATE

FRIEND AND SON,

W. J. HOOKER.

Jungermannia.

+

A noble illustration of these tiny plants was published by Professor Hooker; it forms the most complete monograph of any genus ever published, and is indispensable to all those who would occupy themselves with an inquiry into the habits and differences of the tribe.

Professor John Lindley Ph.D. F.R.S.
p 280 B.Y.

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In Bernard Quenitch's Catalogue¹⁸⁷¹ it is stated as "very scarce" and the price "Twelve pounds 5s."

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BRITISH JUNGERMANNIÆ.

JUNGERMANNIA HUTCHINSIÆ.

(TAB. I.)

JUNGERMANNIA, surculo repente, ramoso: foliis distichis, approximatis, ovatis, planis, dentatis, basi subtus auriculatis, auriculâ minutâ, inflatâ: stipulis rotundato-ovatis, acutè bifidis; laciniis subintegerrimis: calycibus axillaribus, obcordatis, triangularibus.

HAB. Glengariff, near Bantry; along the banks of the first river, as you go from Bantry above the water-fall; and in gloomy caverns by the side of other mountain rivulets.
Miss Hutchins.

PLANT, creeping upon the ground in dense imbricated patches, of a deep almost blackish-green color, and extending some inches in diameter; producing a few whitish, fibrous radicles from various, but, principally, from the lower parts of the stem.

Stems scarcely the tenth of a line in diameter, an inch or an inch and a half in length, filiform, flexuose, furnished here and there with a few rather long, scattered, patent or horizontal branches, which are again either once or twice beset in the same manner with shorter ramuli, or, as frequently happens, divided in a dichotomous manner, the whole of them disposed in the same plane as the stem, whence the plant has a pinnated appearance. The *texture* of both stems and branches is by no means brittle, and rather closely cellular; their *color* a dark olive green inclining to brown.

The *Leaves* (f. 3.), which are bifarious and distichous, are rather loosely imbricated, slightly decurrent at the base, auriculate, about a quarter of a line in length, ovate, plane or but slightly convex on the upper surface, its margins furnished with rather

distantly-placed, spiniform teeth, the largest generally forming the apex of the leaf; these teeth give the whole plant a most beautiful appearance, and are of such a size as to be conspicuous, even to the naked eye, when the plant is held against the light: that part which is in reality a lesser division of the leaf, or *lobule*, or, as it is called by Linnæus and in the specific character, *auricle* (f. 5.), is very minute, scarcely measuring the twentieth part of a line in length, appearing an *ovate, inflated* appendage, frequently having a spiniform deflected tooth; it is attached near the base of the lower margin of the leaf, or, more correctly speaking, the *lobe*, to the under surface of which it is closely appressed. The *reticulation* of the whole is small and opaque, with areolæ or cellules of a very irregular figure, but approaching to quadrate. The *color* is a very dark green with an olive tint: when held against the light the auricles appear of a deeper hue in consequence of their figure: this form, indeed, is not the same throughout the whole plant; as may be seen in the terminal leaves (f. 6.), which do not appear to have arrived at their full size; they differ widely from the rest in being divided into two lanceolate segments; the smaller one of which is the expanded auricle, and scarcely a fourth less than the larger division; both are spinuloso-dentate. Exactly similar to these are the

Perichatial leaves (f. f. 7. 11.), of which there are two, embracing with their segments the lower part of the calyx.

Stipules ovate, approaching to orbicular, divided nearly half way down from the extremity, by an acute sinus, into two, equal, slightly-denticulated, sharp segments. There is one stipule to each pair of leaves, which in *color* and *texture* they exactly resemble.

MALE FRUCTIFICATION, at present unknown.

FEMALE FRUCTIFICATION, as far as I have hitherto had the opportunity of remarking, always arising from the axillæ of the branches (f. 2.).

Calyx, (f. f. 8. 9. 11.) rather more than half a line in length, obcordate, compressed and plane on its upper surface, its under side prominent with a longitudinal ridge, so that a transverse section would present the figure of a triangle: the mouth small, contracted, a little elevated and entire.

Calyptra, between oblong and ovate, tipped with a short style; its texture rather thick and succulent, every where reticulated; of a very pale, yellowish-brown color. A few abortive pistilla surround the base, which are minute, linear, or a little swelling in the centre, of a greyish color.

Peduncle, three-quarters of a line long, white, succulent, longitudinally and transversely striated, dilated at its upper extremity, where it unites with the reddish-brown spherical

Capsule, which is externally deeply punctured; it splits into four equal ovate valves, which soon become revolute, and in that state continue to retain the

Spiral filaments (f. f. 12. 13.) at their extremities: each of these is composed of a single *helix*, of a deep, rich brown or fulvous color, enclosed in an extremely delicate transparent tube. The *seeds* (f. f. 14. 15.) are of the same color as the filaments, exactly spherical, and, under a highly magnifying power of the microscope, are seen to be covered with opaque dots, which are probably minute tubercles.

BRITISH JUNGERMANNIÆ.

(*J. Hutchinsia*.)

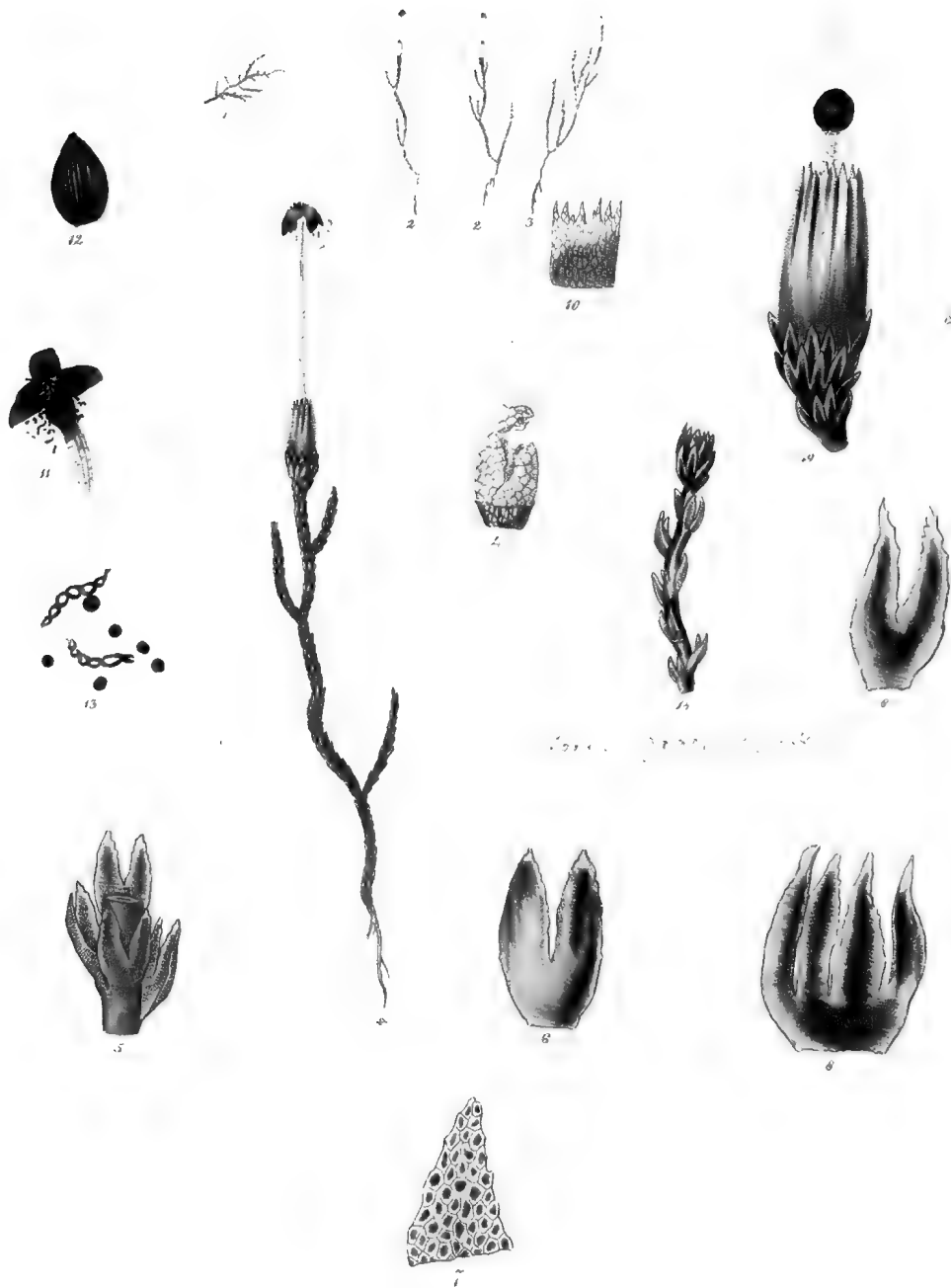
Obs. I am happy in being able to devote the first plate of a *History of the British Jungermanniæ* to a perfectly new and distinct species, and still more so in the opportunity it affords me of dedicating that species, one of the most beautiful with which I am acquainted, to its discoverer, Miss Hutchins, of Ballylickey, near Bantry; a lady whose valuable communications on the subject of marine Botany are already before the public in the *Historia Fucorum*, as well as in the *British Confervæ*, and whose zeal and knowledge in the present genus of plants I shall frequently have occasion to notice in the progress of this little work. To her, through the kindness of my friend, Mr. Turner, I am indebted for many of the most rare and interesting species which will here be described.

J. Hutchinsia was originally found, two years since, growing on a spot of ground which also produced *J. trichophylla* and *Saxifraga Geum*. It belongs to a small but very natural family (including *J. dilatata* and *tamariscifolia*), differing from the rest of the *Jungermanniæ stipulatæ* in having a *lobulus*, or what, in compliance with the Linnæan terminology, I am induced to call *auricle*, which, in by far the greater number of the leaves, is rolled up into a small vesiculated appendage, and in having each of the spiral filaments composed of a single *helix* attached by its base to the extremity of the segments of the capsule, and enveloped in an extremely thin pellucid tube. From the two *Jungermanniæ* last mentioned, the present species abundantly differs in a variety of respects, and may at all times readily be distinguished by its dark-green color, and still more certainly by the strongly denticulated margins of the leaves.

REFERENCES TO THE PLATE.

FIG.

1.	Fertile plant of <i>J. HUTCHINSIÆ</i> , natural size.	
2.	Portion of the same, magnified	6
3.	Portion of the Stem and Leaves, seen from the under surface	4
4.	Stipule	3
5.	Lobule	3
6.	Terminal Leaf	4
7.	Perichæatial Leaf	4
8.	Calyx (upper surface)	4
9.	Interior of the Calyx, with the Germen	4
10.	Calyptra, with the barren Pistilla and the lower part of the Peduncle	3
11.	Calyx, with the two Perichæatial Leaves, Peduncle, and Capsule; the latter in the act of bursting and discharging its seeds	4
12.	Upper part of the Peduncle and Capsule; the valves expanded and retain- ing the spiral filaments	3
13.	Spiral filaments enclosed in their tube	1
14.	Seeds	2
15.	The same	1



Jungermannia julacea.
Anthelia julacea (L.) Dum.

JUNGERMANNIA JULACEA.

(TAB. II.)

JUNGERMANNIA, caule erectiusculo, vagè ramoso, filiformi: foliis quadrifariis, ovatis, acutè imbricatis, erectis, acutè bifidis; segmentis lanceolatis, acuminatis, subserratis: fructu terminali; calycibus oblongis, supernè plicatis; ore aperto, dentato.

Jungermannia julacea. LINN. *Sp. Pl.* II. p. 1601. *Syst. Nat.* II. p. 706. *Fl. Lapp. ed. SMITH.* p. 342. SCHRADER, *Samml.* II. p. 4. n. 94. WEBER, *Spicil.* p. 151. n. 215. HUDS. *Angl.* p. 516. LIGHTF. *Scot.* II. p. 785. WITH. III. p. 863. LINN. *Syst. ed. Gmel.* II. p. 1352. LAMARCK, *Encycl. Bot.* III. p. 285. *Engl. Bot. t.* 1024.
Jungermannia caule filiformi, foliis appressis, inconspicuis. HALL. *Helv.* III. p. 63. n. 1882.
Lichenastrum alpinum, Bryi julacei argentei facie. DILL. *Musc. t.* 73. f. 38.

β. GRACILIS; caulibus elongatis: foliis parvis, remotiusculis.

HAB. Welsh mountains, *Dillenius* and *Mr. Griffith*.—Ben Lawers and Craigalleach, in Breadalbane; Ben Nevis, Ben Luyal, and Cairngorum.—β. On the summit of Ben Nevis, in wet places at its eastern extremity.

PLANT growing in dense patches of considerable extent; when barren thickly entangled and matted together.

Stems in a barren state usually procumbent, in fertile specimens erect, from half an inch to an inch and a half in length, of an equal thickness throughout, of a dirty brown color, rigid and brittle when dry, irregularly divided, and generally more or less beset with branches, which are equally uncertain in their number, disposition, and length, and are subpatent.

Leaves closely imbricated and appressed, surrounding the stem on four sides (f. 5) and entirely concealing it, erect, nearly ovate, flat, or but very slightly concave, acutely cleft to about three-fourths of their length into two equal segments, which are straight, ovato-lanceolate and acuminate, their margins very obscurely serrated: the terminal leaves, which usually grow in clusters, differ from the rest in having the segments more lanceolate and acute, and in being more evidently, though very unequally, serrated.

(*J. julacea*.)

BRITISH JUNGERMANNIÆ.

The *reticulation* (f. 7.) is large in proportion to the size of the leaf, and formed by cellules of a somewhat rounded figure, which are opaque in the centre. The *color* of the leaves, when the plant grows in the shady crevices of rocks, is generally a dirty green approaching to olive, but when it is in a more exposed situation, it is a pale silvery white, which under the microscope seems to be caused by an extremely minute granulated substance, probably an exudation from the leaves. This color and appearance are particularly prevalent in wet spongy places, and my *var. β* (f. 15) possesses them in a very striking degree.

The *perichatial leaves* (f. f. 8, 8) surround the calyx for nearly a third of its height; the exterior ones differ from those of the stem only in being larger and somewhat plicated: the interior are quadripartite, much resembling the stem-leaves of *J. setiformis*.

MALE FRUCTIFICATION I have not seen.

FEMALE FRUCTIFICATION terminal upon the stems and branches.

Calyx (f. 9) oblong, longitudinally plicated in the upper part, and toothed or lacerated at the margin, where it is white and diaphanous, while the rest is of a dirty brown or olive color; the whole comparatively of a rigid texture, marked throughout with small oblong reticulations (f. 10).

Calyptra (f. 14) ovate, thin, of a dirty white color, reticulated, tipped with a minute style, and bearing near its base two or three *abortive pistilla*: the base itself is firmly united to the lower part of the calyx, and not separable from it.

Peduncle scarcely a quarter of an inch in length, white, succulent, longitudinally and transversely striated.

Capsule (f. 9) globose, of a shining brownish black, opening into four equal, ovate valves (f. f. 11, 12), which, after the discharge of the seeds, become revolute, some of the filaments still remaining attached to the centre.

Seeds and spiral filaments (f. 13) reddish brown, the former spherical and smooth; the latter short in proportion to their width, and formed of a double *helix*.

Var. β (f. 15) grows to the height of nearly two inches, and has its stem and branches slender in proportion to their length, bearing also more distantly-placed; smaller and less-appressed leaves than *α*. The silvery hue is, as I have before mentioned, very striking in this variety.

J. julacea, which is altogether an alpine species and a plant of unfrequent occurrence, is, by its size, its mode of growth, and its color, readily distinguishable from every other, except indeed from *J. concinnata*, to which in all these particulars it is very nearly allied. From this it differs, as well in the shape of the leaves, as in their disposition, they having the appearance of being imbricated on all sides, though in reality they are quadrifarious, whence arises a quadrangular form in the stems and branches. These shoots too are of an equal thickness

throughout, instead of being evidently incrassated towards the extremities, and the calyces are large in proportion to the size of the plant; whereas I have never been able, in the specimens I have examined of *J. concinnata*, to satisfy myself of the actual existence of any calyx at all. Truly, however, and essentially as these two species are distinct, they have been confounded by the older writers, and, indeed, appear to have been so by almost every author prior to the time of Lightfoot; so that I dare not venture to speak with certainty of the greater part of the above synonyms. That of Dillenius, indeed, admits of no doubt, and his figures are excellent. The similarity to *Bryum argenteum*, however, which he dwells upon, and which has given birth to the name* of the species before us, arising from its color and from its concave closely-appressed leaves, is more applicable to *J. concinnata*. Linnæus' plant, judging from his description, as well as from the specimens in his herbarium, is the same as ours. Weber seems rather to refer to *J. concinnata*, when he says it has leaves "ita appressa, ut vix ne lente quidem distingui possint, (quâ notâ ab omnibus faciliè distinguitur);" and that the surculi are, when moist, "lætè virides, splendentes," but in a dry state "argenteo splendore donati, omninò uti *Bryum argenteum*." Yet in another passage he remarks, "Setas non vidi, verum surculos versus apices incrassatos, terminatos calyculis membranaceis, pellucidis, parvis granulis repletis," which can only be said of *J. julacea*, *J. concinnata* being destitute of calyces. Hudson has done no more than copied the words of Linnæus. Lightfoot has well distinguished the two; and we are indebted to him for first describing *J. concinnata*. The figure in the *Flora Danica*, quoted by Withering, does not represent our plant, though the description of this latter author may be intended for it, as that of Haller certainly is.

Other writers, besides those above mentioned, have introduced in their works *J. julacea*: but these in my opinion all mean *J. concinnata*. Among them are Doctor Roth and Ehrhart, the latter of whom in particular says the leaves of *J. julacea* are bifarious†, which is undoubtedly the case with *J. concinnata*, but not with this. Their exact situation, however, is not easily determinable on so diminutive a plant; nor was it till after a careful investigation that I was able to satisfy myself that they were placed in fours.

Mr. Sowerby, in his otherwise excellent figure in *English Botany*, has represented the leaves as undivided, which is never the case in the plant; although, owing to the deepness of the cleft and the brittleness of the texture, it is more easy to separate half a leaf from the stem than a whole one.

* *Bryum argenteum* was called by Dillenius "*Bryum pendulum julaceum, argenteum et sericeum*."

† Ehrhart even goes farther, and says, that all the *Jungermanniæ foliosæ* have bifarious leaves, in which he is unquestionably mistaken. His words are, "Die *Jungermannia julacea* L. hat, so wie alle mir bekannten wahren *Jungermanniæ foliosæ*, folia bifaria, weil solche aber etwas klein und angedrückt sind, so fällt solches hier weniger, als bei andern Arten, in die Augen, kann aber dennoch recht gut gesehen werden." *Beitr. Band. 3, p. 80*.

REFERENCES TO THE PLATE.

FIG.

1. Barren plant of <i>J. julacea</i> , natural size.	
2, 2. Female plants, natural size.	
3. Var. β , natural size.	
4. Female plant magnified	6
5. Portion of the stem	4
6. Leaf	3
7. Apex of a leaf to shew the cellules	1
8, 8. Exterior and interior perichæatial leaves	3
9. Calyx and capsule	4
10. Portion of the margin of the calyx	1
11. Capsule discharging its seeds	4
12. Valve of the capsule	3
13. Seeds and spiral filaments	1
14. Calyptra, with a portion of the calyx at its base	4
15. Portion of the stem of Var. β	5



JUNGERMANNIA CONCINNATA.

(TAB. III.)

JUNGERMANNIA, caule erecto, ramoso, apice incrassato compressoque : foliis bifariis, arctissimè imbricatis, compactis, erectis, concavis, ovatis, obtusis, emarginatis : fructu terminali ; calycibus nullis.

Jungermannia concinnata. LIGHTF. Scot. II. p. 786. WITH. III. p. 863. Engl. Bot. t. 2229.
Jungermannia julacea. Fl. Dan. t. 1002. (benè.) HOFFMANN, Germ. II. p. 82. ROTH,
Germ. III. p. 366. SCHRADER, Spicil. p. 75. LAMARCK, Fl. Fr. ed. 2. II. p. 437.

HAB. Barren spongy places near the summits of the Scotch and Irish mountains, abundant.

PLANT growing always in very thickly-matted tufts, often covering a surface of ground of some feet in diameter ; conspicuous at a considerable distance from its silvery hue.

Stems nearly erect, occasionally procumbent at the base, varying from their most common height of scarcely half an inch to an inch or more, simple, or bearing here and there a few, scattered, patent or suberect branches, which, as well as the stems themselves, are cylindrical and filiform in their lower parts, but towards the apices visibly incrassated and compressed : the *color* of both stems and branches is a dirty brown ; when dry they are brittle.

Leaves (f. f. 4. 5) erect, bifarious, closely imbricated in two rows, so as entirely to conceal the stem, resembling (as Lightfoot well remarks), under a highly-magnifying power, the texture of a braided lock of hair, or that of a plaited-thonged whip : they are concave, ovate, acutely emarginate at the extremity, with obtuse and entire segments. The cellules are minute, the interstices wide, forming a pellucid *reticulation*. The *color* is a yellowish green, more or less inclining to brown, having a silvery and glossy appearance like that of *Bryum argenteum*, which cannot well be represented in the drawing, and is particularly conspicuous in the dry specimens. Some plants, indeed, which grow on much exposed rocks, want this appearance altogether, and are of a deep purplish brown almost inclining to black : in every state much of the margin of the leaf, and sometimes the extremity, for one-third of the way down, is diaphanous, whitish, and, as it were, scariose.

(*J. concinnata*.)

BRITISH JUNGERMANNIÆ.

The *perichætal leaves* (f. f. 6. 6. 7) are imbricated on all sides; the exterior resemble the cauline ones, except in being somewhat larger; the rest gradually grow wider in proportion to their length, and become less scariose at the margin, firmly embracing and surrounding each other; the innermost appear to answer the purpose of a calyx, enclosing the peduncle in the form of a cylindrical tube, which, indeed, is scarcely distinguishable from a true calyx, except by the longitudinal suture, formed by the involuted margins (f. 7); in color and texture they resemble the other leaves, only that they are paler and have generally a purple or brownish tinge near the apex.

MALE FRUCTIFICATION I have never seen.

FEMALE FRUCTIFICATION terminal on the stems and branches.

Calyx none that I have ever been able to discover.

Calyptra (f. 8) ovate, pellucid, white, surrounded at the base with a few *barren pistilla*, some of which I have seen attached here and there to various parts of its surface.

Peduncle white, succulent, scarcely a quarter of an inch long, striated longitudinally and, also, though less evidently, transversely.

Capsule minute, nearly spherical, of a reddish and shining brown color, strongly punctated.

It bursts into four equal, ovate segments, discharging numerous and extremely minute

Seeds and *spiral filaments*, which I had not an opportunity of representing on the plate, not having received them till the engraving was finished: they are of a deep fulvous color; the former exactly spherical, the latter somewhat longer than those of *J. julacea*, and composed of a double *helix*.

This species grows profusely on the summits of the mountains of the North Highlands of Scotland, and appears to be equally common on the Continent. In Iceland it is likewise extremely abundant, more so than any of the genus, and I suspect is every where more frequently met with than *J. julacea*, which, as already observed under that plant, it greatly resembles in many particulars. Its mode of growth is very uniform, and the even tops of all the shoots is striking, though it occasionally happens that specimens are found, from the centre of the thick blunt ends of which are produced small, thin, cylindrical shoots, either simple or forked, as in *Bartramia fontana* or *Fucus lumbricalis*, destined in all probability to supply the flowers of the following season, and then to grow in every respect similar to the stems they proceeded from.

It is to Mr. Lightfoot, as has been also observed under the description of *J. julacea*, that the credit is due of first distinguishing the two plants, and accurately defining their characters. *J. concinnata* has, indeed, long been well-known on the Continent, though not separated from *J. julacea*, under which name many of those authors have described it; misled, perhaps, by a remark of Ehrhart, in his *Beiträge**, where he says that *J. julacea* has bifarious leaves. The

* *Beitr.* Band, 111, p. 20.

BRITISH JUNGERMANNIÆ.

(*J. concinnata*.)

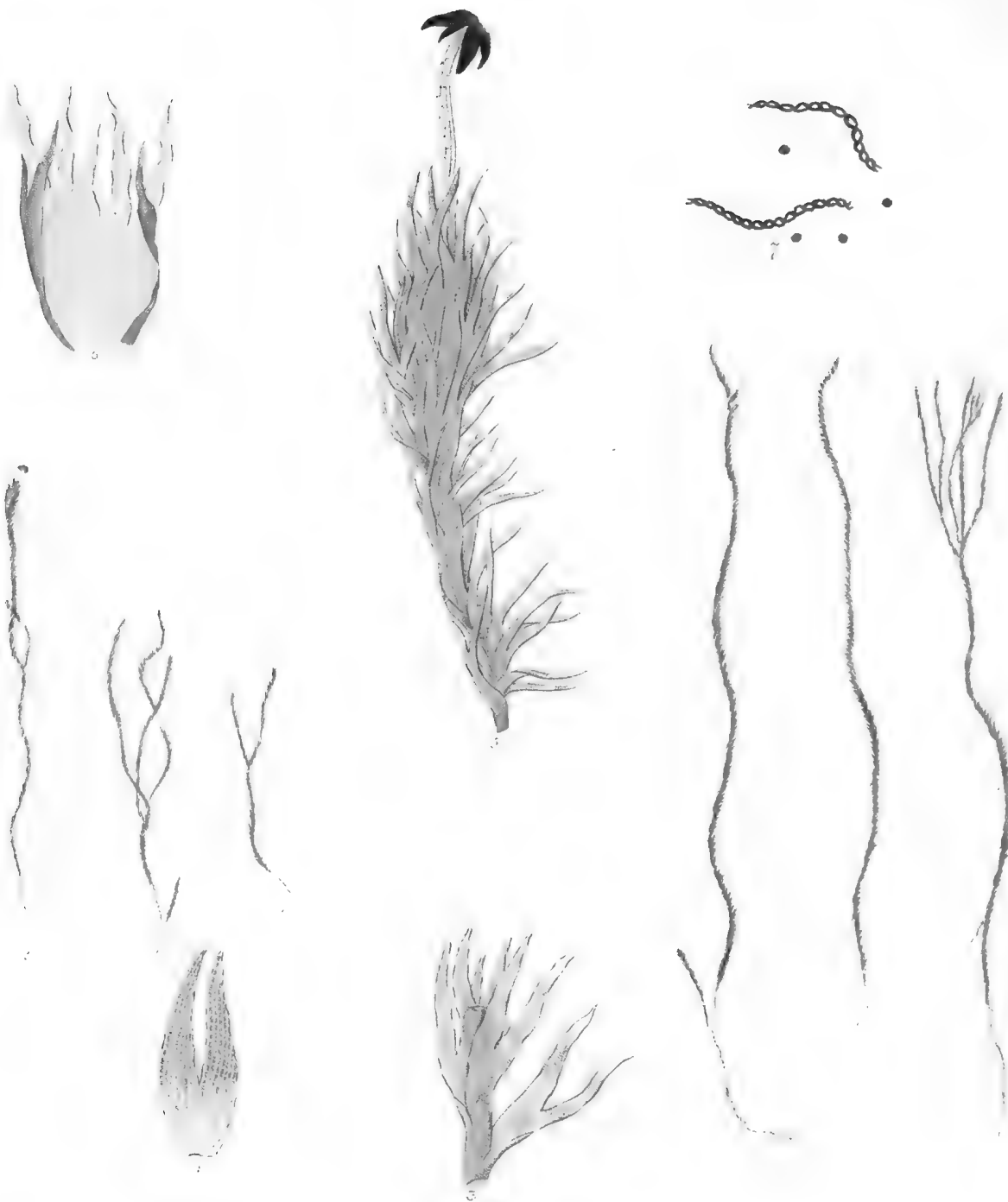
figure in *Flora Danica* is good, except that the terminal or perichæatial leaves are not represented as imbricated on all sides, and something like a calyx is there given as rising above the leaves, which I have never been able to observe in the many specimens that have come under my observation. Roth also describes a calyx "in caule vel ramis terminalis, monophyllus, tubulosus, truncatus;" probably mistaking the inner perichæatial leaf, as I myself did at first, for a true calyx. I however was afterwards induced to be of a different opinion, and in various dissections have uniformly found this species to possess, instead of the calyx, an inner and tubular perichæatial leaf, as above described. If I have not been deceived in my examination of this species, by the minuteness of the object, the absence of a real calyx in this plant may be considered as connecting it more closely with the order of Musci, and especially with the genus *Andræa*, to two of the species of which (*A. rupestris* and *alpina*) it approaches, also, in habit and ramification.



REFERENCES TO THE PLATE.

FIG.

- | | |
|----------------------------------------------------------------------------------------------------------------------------|-----|
| 1, 1, 1. Barren plants of <i>J. concinnata</i> , natural size. | |
| 2. Female plant, natural size. | |
| 3. Female plant magnified | 6 |
| 4. Portion of the stem and leaves | 4 |
| 5. Leaf | 2 |
| 6, 6. Exterior perichæatial leaves | 3 |
| 7. Interior perichæatial leaf | 3 |
| 8. Extremity of a fructified stem, with a portion of the inner perichæatial
leaf, calyptra, peduncle, and capsule | } 4 |



Jungermannia juniperina.
Herberta aduncis Lichs. may

JUNGERMANNIA JUNIPERINA

(TAB. IV.)

JUNGERMANNIA, surculis erectis, simpliciusculis, rigidis; foliis imbricatis, lanceolato-falcatis, bipartitis, secundis. Sw.

Jungermannia juniperina. SWARTZ, *Prod.* p. 144. *Fl. Ind. Occ.* p. 1855.

β. JUNGERMANNIA, caule erecto, flexuoso, subsimplice: foliis quadrifariis, undique imbricatis, falcato-secundis, lineari-lanceolatis, bipartitis; segmentis rectis, acuminatis: fructu terminali; calycibus ovatis, laciniatis, perichætio obtectis.

Jungermannia adunca. DICKSON, *Crypt. fasc.* III. p. 12. t. viii. f. 8. WITH. III. p. 862.

HAB. β. On shady spots on the Scotch Alps. Mr. Dickson.—On Cairngorum, Ben Nevis, Ben Lawers, Ben Arthur, and on Ben-y-caillich, in the Isle of Skye.—On mountains near Bantry, Ireland. Miss Hutchins.

OBS. The variety β alone, of this species, having been found in Britain, to that I shall confine my description.

PLANT growing erect in densely-crowded tufts of several inches in diameter.

Stems scarcely so thick as pack-thread, and of rather a bright reddish-brown color, from two to three and even five inches in length, flexuose, having the apices slightly incurved, either simple, or now and then producing a solitary short lateral shoot, or, as is sometimes the case, divided near the extremity into five or six branches of nearly equal height.

Leaves in four rows, in some specimens thickly imbricated, in others more widely placed, of a lanceolate figure, falcato-secund, divided for nearly three parts of their length by an acute sinus, into two equal, entire, acuminate and strait, or at most but little divaricating, segments: the terminal leaves (f. 4) are more inclining to ovate, and have always the lower half diaphanous, the upper one being of the same color as the whole of the other leaves, a yellow brown, pale in general, but deeper in

(*J. juniperina*.)

BRITISH JUNGERMANNIÆ.

more exposed situations. The substance is extremely rigid, composed of distantly-placed, oblong, opaque cellules, the interstices of which are pellucid.

Perichæatial leaves numerous, crowded, so united together at their bases as to constitute a complete calyx: their acuminate segments alone are free, and form a lacinated margin.

MALE FRUCTIFICATION I have never seen.

FEMALE FRUCTIFICATION terminal.

Calyx (f. 6) about three-quarters of a line long, an ovate, plicate, tubular membrane, formed, as before observed, by the union of several of the perichæatial leaves, the lower undivided halves of which grow so entirely joined, that no suture is visible, while the segments, remaining separate, exhibit the appearance of a quantity of erect lanceolate laciniae, exactly equal in number to double the quantity of leaves connected.

Calyptra ovate, white, semi-transparent, tipped with a short brown style, and surrounded at the base by numerous greyish *abortive pistilla*, which are almost linear, or slightly incrassated towards the base.

Peduncle short, scarcely two lines in length, white, pellucid, cellulose.

Capsule subrotundo-ovate, dark brown, dividing into four equal ovate valves.

Seeds and spiral filaments (f. 7) of a deep fulvous color; the former spherical, the latter composed of a double *helix*, slightly attenuated at each extremity.

J. juniperina has no affinity whatever with any British species, but approaches, as well in habit as in the texture of its leaves, to a Jungermannia not yet described, gathered in New Zealand, by Mr. Menzies. After a most careful examination of authentic specimens of Mr. Dickson's *J. adunca*, compared with others of *J. juniperina*, which I have received from Dr. Swartz, I am not able to find any characters which can induce me to keep them separate. The latter plant is indeed of a larger size than the former, and possesses one striking peculiarity, which is, that, on immersing a dry specimen in water, the absorbent vessels are immediately put in action, and the remarkable divarication of the segments of the leaves, noticed by Dr. Swartz, appears almost at the same moment: the laciniae of the calyx, too, become reflexed. Our British variety, on the contrary, recovers extremely slowly in water, and after an immersion, even of very long duration, the segments of the leaves still remain strait, and those of the calyx erect. It is singular that the only stations of this plant at present known are the loftiest of the British Alps and the blue mountains in Jamaica.

Specimens in fructification of my var. β are of rare occurrence. I possess them only through the kindness of Mr. Dickson, who gathered them in Scotland. The figure and description of the species in the *Fasc. Plant. Crypt.* are good, except that they represent it as having undivided leaves. The peculiar structure of the calyx did not escape the observation of the author of the *Flora Indiæ Occidentalis*, who has accurately described the Jamaica variety in the following words: "Perianthemum e foliolis externis, confertis, bipartitis, patenti-reflexis; intimis erectis, indivisis, carinatis, conniventibus, pallidis, rigidis."

BRITISH JUNGERMANNIÆ.

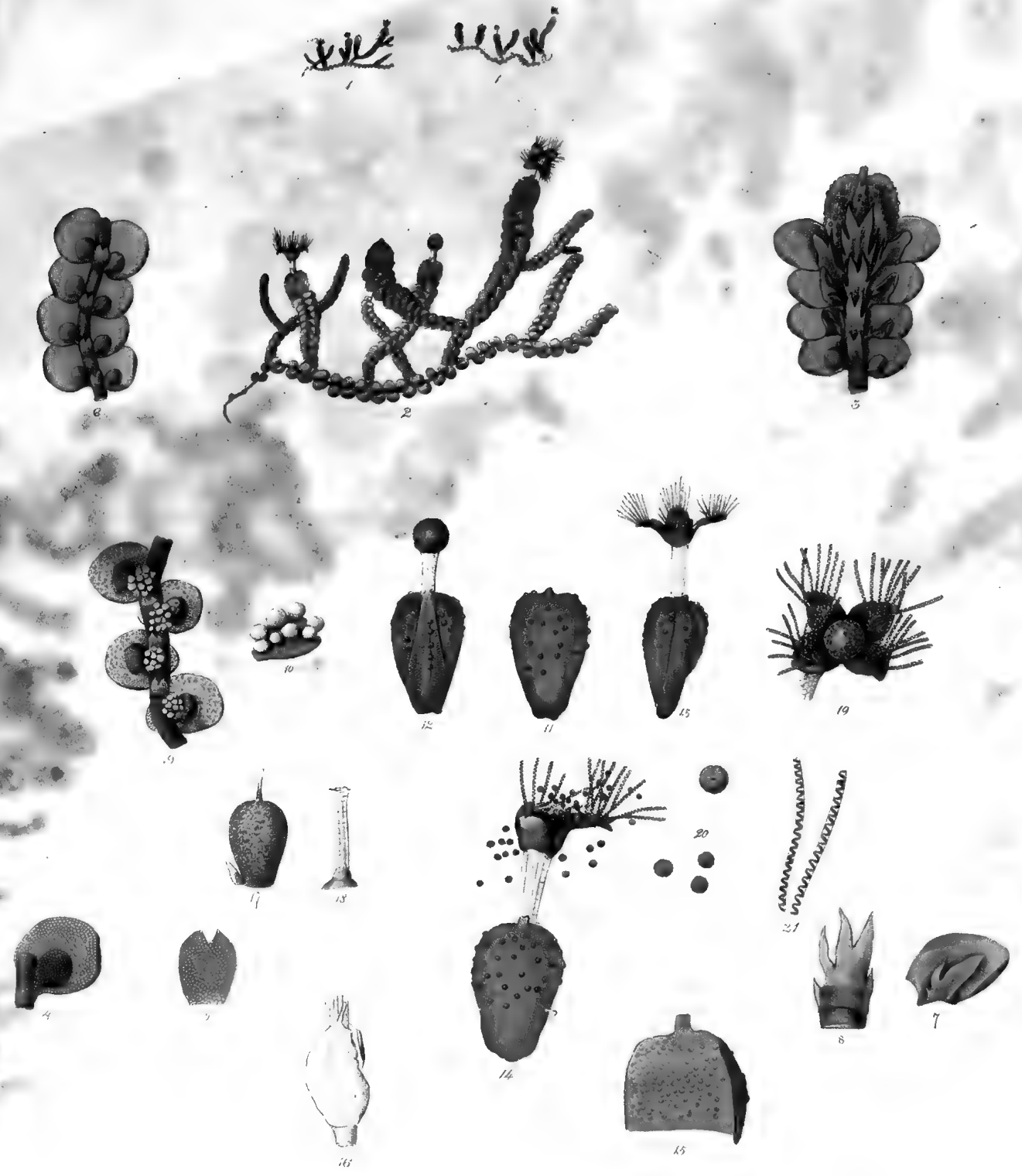
(*J. juniperina*.)

I have already, in a paper printed in the *Transactions of the Linnæan Society*, v. x. p. 396, taken the opportunity of remarking, under the description of *Andræa nivalis*, the general resemblance which that plant at first sight bears to the present one. Their places of growth are the same, as are their falcato-secund leaves and the incurved extremities of the branches, as well as the color of the whole plant. The *Andræa*, however, possesses really entire leaves, which are furnished with a strong nerve.

REFERENCES TO THE PLATE.

FIG.

- 1, 1, 1, 1, 1. Barren plants of *J. juniperina*, natural size.
 2. Fertile plant, natural size.
 3. Portion of the stem and leaves magnified 3
 4. Terminal leaf 3
 5. Fructified extremity 4
 6. Calyx 3
 7. Seeds and spiral filaments 1
-



Jungermannia dilatata.
Protophysa dilatata L. Dem.

JUNGERMANNIA DILATATA.

(TAB. V.)

JUNGERMANNIA, surculo repente, vagè ramoso : foliis distichis, imbricatis, subrotundis, convexiusculis, integerrimis; basi subtùs auriculatis; auriculà minutà, ventricosà : stipulis rotundatis, planis, emarginatis : calycibus terminalibus, obcordatis, tuberculatis, triangularibus.

Jungermannia dilatata. LINN. *Sp. Pl.* II. p. 1600. *Syst. Nat.* II. p. 706. *Fl. Suec.* p. 402. GOUAN, *Monsp.* p. 452. POLLICH, *Pal.* III. p. 192. SCOP. *Carn.* II. p. 346. LEERS, *Herb.* p. 251. WEIS, *Plant. Crypt.* p. 126. WEBER, *Spic. Fl. Goet.* p. 146. WILLD. *Ber.* p. 341. ORDER, *Enum. Pl. Fl. Dan.* p. 42. ALLIONI, *Ped.* II. p. 313. SCHRANK, *Baiersche Flora.* II. p. 499. VILLARS, IV. p. 925. HOFFMANN, *Germ.* II. p. 85. RELHAN, *Cant.* p. 439. HUDS. *Angl.* p. 514. LIGHTFOOT, *Scot.* II. p. 781. LINN. *Syst. Nat. ed. Gmel.* II. p. 1351. WITH. III. p. 860. LAMARCK, *Fl. Fr. ed. 2.* II. p. 434.

Jungermannia tamariscifolia. SCHREBER, *Spic. Fl. Lips.* p. 108. SCHRADER, *Samml. Lief.* 2. p. 6. SCHMIDEL, *Icones.* p. 256. t. 67. *Engl. Bot.* t. 1086. ROTH, *Germ.* III. p. 408.

Jungermannia cupressiformis. LAMARCK, *Encycl.* III. p. 283.

Lichenastrum imbricatum minus. RAII *Syn.* p. 111.

Muscoides minimum foliis alternis, superioribus circinatis, inferioribus cucullatis, flore pediculo ferme carente. MICHELI, *Nov. Gen.* p. 10. t. 6. f. 6.

Hepaticoides, foliis subrotundis squamatim incumbentibus minor. VAILLANT, *Bot. Paris.* p. 100. n. 6. t. 19. f. 10.

Lichenastrum imbricatum minus, squamis convexo-concavis. DILL. *Musc.* p. 497. t. 72. f. 27.

Jungermannia, foliis imbricatis, alternis, orbiculatis, setis brevissimis. HALL. *Helv.* III. p. 62.

HAB. On the trunks of trees, most abundant, every where.—In fruit during most of the winter season.

PLANT firmly attached to its place of growth, where it forms dense, compact and circular, brownish-purple patches, from two to many inches in diameter.

Surculi about three-quarters of an inch in length, imbricated one over another, creeping, flexuose, once or twice irregularly divided into many short, patent branches, of which the fertile ones are somewhat incrassated upwards, the rest are filiform throughout.

Leaves (f. 6.) bifarious and distichous, alternate, auriculated, distantly placed in the lower parts of the plant, the rest so closely imbricated as entirely to conceal the upper side of the surculus, the cauline ones scarcely exceeding the fifth of a line in diameter, those in the fertile shoots becoming rather larger as they approach the calyx: they are of an orbicular figure, above slightly convex, varying in color from a deep purple hue to an olive-green in more sheltered situations, entirely devoid of gloss, furnished at their base with an *auricle* (f. 4), which generally inclines more to a greenish hue, and is in its appearance widely unlike the leaf, in different parts of the plant putting on a different appearance (f. 3). In the barren branches this *auricle* is about one-fourth of the size of the leaf, attached to its lower margin, and closely appressed to its inner surface, nearly spherical, with an opening beneath, whence Micheli has aptly applied to it the term "*cucullatus*". In the fructifying branches the same formation of the *auricle* is apparent in the lower parts, but in proportion as it approaches the extremity, the hollow vesicle gradually unfolds: in the fourth pair from the calyx the opening appears wider; in the next above them the margins only are remarkably revolute; in the succeeding pair the margins are so far unfolded as to exhibit a lateral tooth, while the uppermost pair, or

Perichatial leaves (f. 7) have the *auricle* an oblong, obtuse, leaf-like appendage, the margins still a little revolute, and the exterior furnished with one or sometimes two long and sharp teeth; this *auricle* is appressed with its inner and convex surface to the under side of the calyx, while the leaf, which is here more inclining to ovate than in any other part of the plant, has its lower surface applied to the upper side of the calyx. The *texture* of these leaves is exactly similar to that of the rest, composed of exceedingly minute roundish *cellules*, scarcely visible but with a high power of the microscope.

Perigonial leaves, from twenty to thirty or more in number, very closely imbricated, upon short branches, rather smaller than the cauline ones, and remarkably concave or ventricose: the *auricle* is about one-third of the size of the leaf, ovate, concave, each closely tiled over the one above it.

Stipules (f. 5) somewhat wider than the stem, one to each pair of leaves, ovate, approaching to round, quite plane, cleft at the extremity with rather a deep and acute notch: these, likewise, alter their figure as they approach the calyx, becoming larger and divided into three or four unequal *facinæ*, of which in the calycine stipule there are five or six (f. 8). Their *texture* resembles that of the leaves; their *color*, from being less exposed to the light and air, partakes less of the purple tint, and generally is of a dirty green.

MALE FRUCTIFICATION situated in the axillæ of the perigonial leaves, upon the short lateral ramuli.

These perigonial leaves are remarkably closely imbricated, so much so, that the ramulus seen from above has very much the appearance of that of *J. concinnata*, and the whole length

BRITISH JUNGERMANNIÆ.

(J. dilata

of it is marked with a deep line or furrow. In each axilla are two and sometimes three *anthers**, small, spherical, and when perfect of an olive-green color; after the discharge of the pollen, a reticulated, diaphanous cuticle remains, open and lacerated at the top. The *filament* is about the length of the anther, white, pellucid, transversely striated. In January, 1808, I gathered specimens of this plant, upon the under sides of the stems and branches of which were scattered clusters of minute spherical granules (f. f. 9. 10), whitish, but inclining to flesh-colored, sessile, or on extremely short footstalks. These, however, as I was unable to perceive any thing resembling the usual reticulated structure of the anthers of the genus, I was (even before I became acquainted with the true male organs) rather inclined to suspect were some adventitious substance, in which opinion I am now more fully confirmed.

FEMALE FRUCTIFICATION terminal upon the branches.

Calyx (f. f. 11. 12. 13. 14. 15) two-thirds of a line long, obovate, approaching to obcordiform, plane on its upper surface (f. 11); from its under surface there is a projecting ridge or angle (f. f. 12. 13), widest at its base, which, together with the two angular sides of the calyx, form a triangle in a transverse section. The whole is externally beset with numerous minute fleshy tubercles; the *mouth* is exceedingly contracted, and forms a small hollow apiculus, which divides in halves for the emission of the capsule. The *color* is usually a deep purplish brown above, below more or less green.

Germen (f. 17), when arrived at its full size, of a beautiful green color, surmounted by a long and slender style (f. 18), dilated at the mouth, streaked longitudinally with reddish lines, and transversely with greyish ones. At the base of the germen are attached a few *barren pistilla*, of a greyish color, swollen at the base.

Calyptra (f. 16) oblongo-obovate, rather fleshy, whitish, of a compact texture, scarcely appearing reticulated.

Peduncle white, succulent, cellulose, about half as long again as the calyx.

Capsule (f. 12) spherical, pale yellow brown, bursting into four acute, ovate valves (f. 13).

The seeds being discharged, the naked extremity of the peduncle becomes visible within the capsule, and forms a greyish, semi-pellucid, orbicular base (f. 19).

Seeds (f. 20) fulvous, spherical, minutely tuberculated, so as to have a spotted appearance. The *spiral filaments* (f. 12) consisting of a simple *helix*, enclosed in an extremely delicate, transparent tube, both adhering by their base to the apices of the valves of the capsule, where they represent a beautiful tuft or crest on each (f. f. 13. 14. 19).

* Schmidel was not equally fortunate with myself; being unable to discover, or even to guess correctly at the situation of, the anthers in this species. "Flosculus junior," he says, "calice etiam jam satis adulto, in ejus fundo hæret; quare fere videtur, ibi, ante quam etiam calix adolescat, fecundationem celebrari, adeo ut apiculus calicis dein propior forte sit aciculæ flosculi, quæ stylus est. An vero alio mense antea organa masculina jam adfuerunt, primordia feminei flosculi fecundantia? An in apice ramorum, quamdiu adhuc curvantur, fecundatio jam fit et folia cochleara genituram subministrant? Siquidem ea interdum quasi farinosa vidi per siccitatem." Schmidel, *Icones*, p. 258.

This species, to which Linnæus seems to have assigned the name of *dilatata*, either from the circumstance of the greater expansion of the leaves towards the extremity of the fertile branches, or from the whole plant spreading and extending itself on the trunks of trees, has many characters in common with *J. Tamarisci*, and is frequently confounded with it, not only by young botanists, but by authors on the subject. It differs, however, in its place of growth, which is almost universally upon the stems of trees; in its more closely imbricated and compact surculi; in its smaller size; and in its vague ramification. The auricles are also larger in proportion to the leaf and more orbicular; the perichætical leaves are obtuse at the apices, never serrated; and, what will afford a still more certain mark of discrimination than any yet mentioned, the stipules never have their margins revolute, but constantly plane. The whole plant, also, entirely wants the gloss which generally appears on the surface of *J. Tamarisci*.

Micheli, whose figures of *J. dilatata* and *Tamarisci* tolerably well express the respective habit and ramification of each, has fallen into a strange error in attributing to the former of these plants only two pair of leaves (meaning the pair of leaves and their accompanying auricles), and he has on that account removed it to a different division from that which contains *J. Tamarisci*, which he rightly enough ascertained to have five different leaves, in a series; that is, the two leaves, two auricles, and a stipule.

Dillenius, Weber, and Weis, have followed the mistake of Micheli; and, although Schmidel has given a most excellent and elaborate description of this species in the place above quoted, yet he has done it under the name of *tamariscifolia*, supposing it to be the *J. Tamarisci* of Linnæus, and has remarked that *J. dilatata* L. “differt squamâ in parte infimâ unicâ, ut Dillenius describit et pingit.” He proceeds, however, to describe the intricate structure of the foliage in the following words: “Infrâ in caule foliola alternant laxiùs, supernè vero pressissimè sunt alterna. In superficie posticâ calix excipitur quatuor, ut videtur, foliolis, duobus lateralibus, duobus intermediis, singulis, ut videtur, communiter bifidis, vel saltem ex ovato acutis, post hæc deorsum tria semper foliola inter se alternant, nempe duo lateralia, unum altero paullo altiùs locatum, intermedium tertium; prima paria horum lateralium acuminata sunt, intermedia etiam, semper vero bifida; ubi vero ad inferiora caulis et quantum circiter par foliorum pervenitur, obtusiora fiunt lateralia, et convolvuntur versus caulem, cochleæ more, adeo ut orbiculata s. peltata quasi adpareant. Ergo propriè quinque ordines sunt foliorum, ut MICHELIUS etiam vult, nempe anticè duo ordines, laterales duo, quorum inferiores cochleatim convolvuntur, mediæ inferiores semper bifidæ.” This author both figures and describes the seeds to be of a greenish color. “Capsula tandem dirimitur,” he says, “in quatuor lacinias sat latas, et in conspectum venit pulvis granulosus, obscure viridis aut luteolus, criniculis minutis inhærens.”

For specimens containing the male fructification of *J. dilatata* I am indebted to the kindness of Mr. Lyell, who gathered them in the New Forest, Hants, on the 21st of March, 1812, (too late for me to have them figured in the plate,) and directed my attention to the *Anther-bearing ramuli* by the following remark: “*J. dilatata* with branches in which the leaves are so closely imbricated as to conceal their alternate position, and form a strap with a deep furrow down the middle.” The alternate position of the leaves, however, is rendered more visible in a dry state by their edges turning up a little, and then the similarity of the shoots to those of *J. concinnata* is very striking. These branches, after supporting and giving nourish-

BRITISH JUNGERMANNIÆ.

(*J. dilatata*.)

ment to the anthers, are destined, in all probability, like the fruit-bearing ramuli of many species of *Fucus*, to form with their leaves larger ramuli, and such as are produced in other parts of the plant. This at least is certain, that in those among them in which are found anthers past perfection and fast approaching a state of decay, the leaves appear in full vigor and of an equal freshness with the common cauline ones.

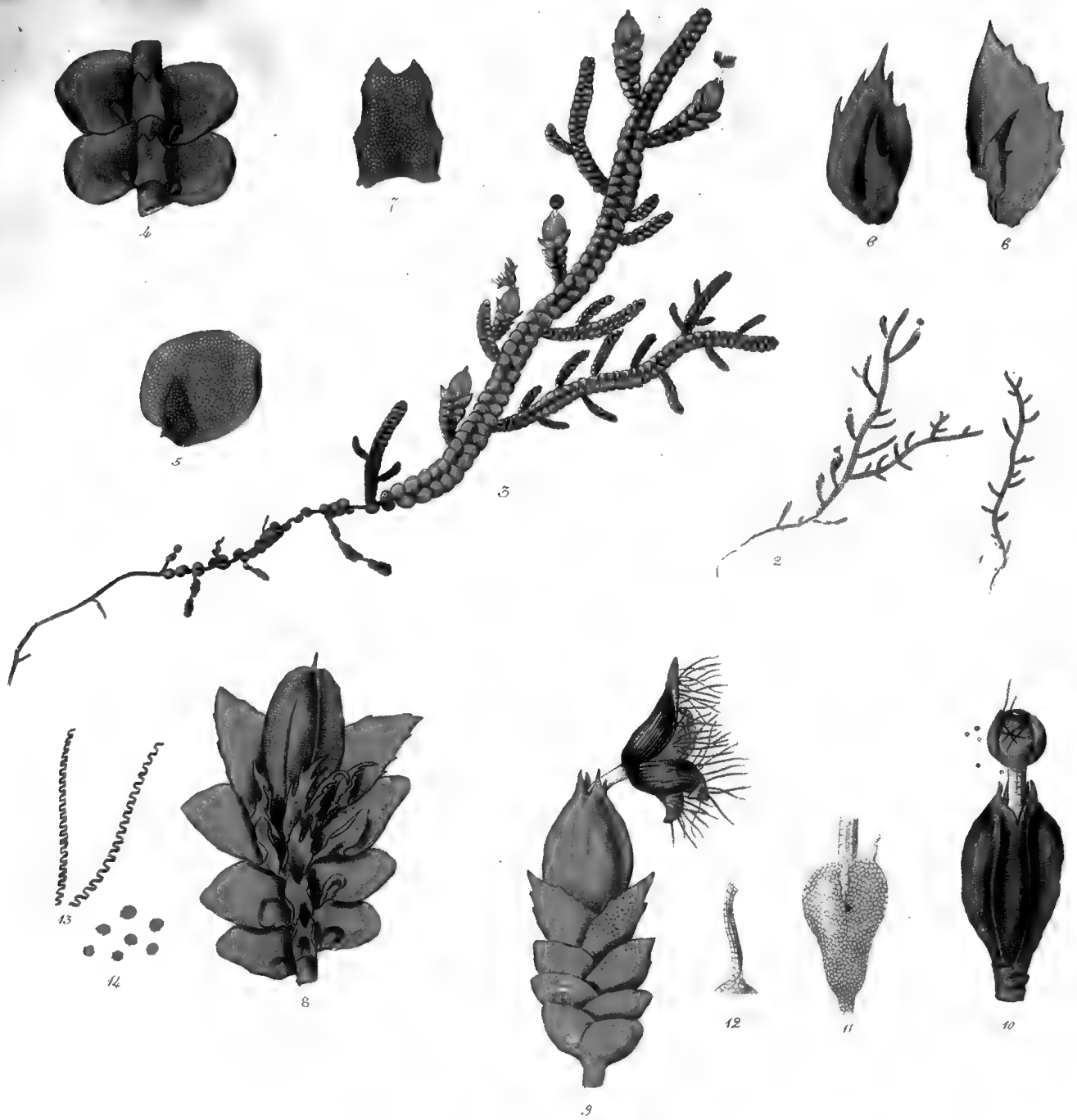
The male fructification, it ought to be remarked, may be seen on the same individual as with the female, though it is by far more abundant on separate plants. So that, in this instance, as I have also had occasion to observe in some others, the genus is to be considered both monœcious and diœcious. The greater number of anthers, in the month of March, had performed their destined functions, in the discharge of the pollen: so, too, had the greater number of capsules ripened and dispersed their seeds.

Of the synonyms above quoted I dare not venture to speak with confidence of any, except that of Schmidel. I think, however, I am correct in those of *Engl. Botany*, *Roth*, and *Schreber*.

REFERENCES TO THE PLATE.

FIG.

1, 1. <i>J. dilatata</i> , natural size.	
2. The same magnified	6
3. Extremity of a fertile shoot, lower surface	4
4. Leaf and auricle	3
5. Stipule	3
6. Portion of a surculus, with auricles and stipules	4
7. Perichæatial leaf and auricles	3
8. Calycine stipule	3
9. Portion of a surculus, with male fructification (?)	4
10. Anthers (?)	3
11. Upper surface of the calyx	3
12. Under surface of the calyx, with the capsule	3
13. The same with the capsule expanded	3
14. The same in the act of dispersing its seeds	2
15. Inside of a portion of the calyx	1
16. Calyptra and lower part of the peduncle	2
17. Germen, with its style and a barren pistillum	2
18. Style	1
19. Inside of an expanded capsule	2
20. Seeds	2 and 1
21. Spiral filaments; enclosed in their tubes	1



Jungermannia tamarisci.

JUNGERMANNIA TAMARISCI.

(TAB. VI.)

JUNGERMANNIA, surculo repente, pinnatim ramoso: foliis distichis, imbricatis, ovato-rotundatis, convexis, integerrimis, auriculatis; auriculis minutis, obovatis, ventricosis; stipulis subquadratis, emarginatis, marginibus revolutis: calycibus in ramis lateralibus terminalibus, obovatis, lævibus, obtusè triangularibus.

Jungermannia Tamarisci *. LINN. *Sp. Pl.* II. p. 1600. *Syst. Nat.* II. p. 706. *Fl. Lapp.* p. 342. *Fl. Suec.* p. 402. POLLICH, *Pal.* III. p. 194. LEERS, *Herb.* p. 251. SCHRANK, *Baiersche Flora.* II. p. 499. WEIS, *Plant. Crypt.* p. 128. WEBER, *Spic. Fl. Goet.* p. 149. WILLD. *Ber.* p. 341. OEDER, *Enum. Pl. Fl. Dan.* p. 42. ALLIONI, *Fl. Ped.* II. p. 313. VILLARS. IV. p. 925. HOFFMANN, *Germ.* II. p. 86. RELHAN, *Cant.* p. 439. HUDS. *Angl.* p. 515. LIGHTF. *Scot.* II. p. 782. LINN. *Syst. Nat. ed. Gmel.* II. p. 1351. WITH. III. p. 860. LAMARCK, *Fl. Fr. ed. 2.* II. p. 433.

Jungermannia rubiginosa. NECK. *Act. Pal.* II. p. 447. t. 1. f. 3.

Jungermannia dilatata. ROTH, *Germ.* III. p. 406.

Jungermannia nigricans. LAMARCK, *Encycl.* III. p. 283.

Hepaticoides, qui Muscus trichomanoides, terrestris, minor, floridus. VAILLANT, *Bot. Paris.* p. 100. t. 23. f. 10.

Muscoides squamosum, saxatile, nigro-purpureum, surculis angustioribus, foliis circinatis, minoribus. MICHELI, *Nov. Gen.* p. 10. t. 6. f. 5.

Lichenastrum imbricatum, Tamarisci Narbonensis facie. DILL. *Musc.* t. 72. f. 31.

Jungermannia foliis imbricatis rotundis, sternè alternis, convexis, infernè quadrifariis. HALL. *Helv.* III. p. 61.

HAB. On the ground, and creeping over low bushes; in much exposed, sub-alpine situations, plentiful.

* Most authors, and even Linnæus himself, in his *Flora Suecica*, have adopted the name *tamariscifolia*. *Tamarisci*, however, is the one taken up in the *Systema Naturæ* and *Species Plantarum*, for which reason, as well as because it appears to me more applicable than *tamariscifolia*, I have thought proper to retain it.

PLANT spreading in large patches of great extent, loosely attached to its place of growth.

Surculi from two to four inches in length, laxly imbricated, creeping, flexuose, filiform, of a deep brown, sometimes a black color, branched in a pinnated or bipinnated manner with patent or horizontal pinnæ, for the most part alternate, and standing two or three lines from each other, short, but of unequal lengths, and beset with still shorter patent pinnulæ.

Leaves (f. 4) bifarious and distichous: at the base the shoot is generally bare, or, at most, has the leaves distant and much decayed, while in the other parts they are densely and alternately imbricated over the whole upper surface of the surculus: they are about one third of a line long in the larger branches, except at their apices, where, as well as on the smaller ramuli, they are much smaller, and scarcely exceeding half that size; in the fertile shoots, on the contrary, they are smaller at the base, and gradually increase in size towards the extremity; their shape is ovate, more or less approaching to round, convex above, the margins a little involute, especially towards the ends of the leaves, which, indeed, in dried specimens, are generally so much so as to embrace the under side of the surculus: their color, like that of *J. dilatata*, varies from a deep purplish brown to a yellow or dirty green; above they are glossy: the *cellules*, of which the leaf is composed, are small, roundish, forming a most beautiful minute *reticulation*. Attached to the lower margin of the leaf is an *auricle*, appressed to its inner surface near the point of insertion, scarcely equalling the twentieth of a line in length, obovate, inflated, having no visible opening below at the base; on the third or fourth pair from the apex of the fertile shoots, however, an oblong opening is evident, and in proportion as they are situated nearer the calyx, this vesiculated appendage becomes more expanded, so that, in the second pair from the calyx, it is about one fourth of the size of the leaf, oblongo-ovate, obtuse, convex on its under surface, concave on its upper, the margins revolute.

The *perigonial leaves*, from six to eight in number, are closely tiled over each other, of a roundish figure, ventricose; their *auricles*, too, are ovate, ventricose, and closely imbricated.

The *perichætal leaves* (f. 6), of which there is one pair to each calyx, are ovate, acute, and strongly serrated, having their *auricles* about one-fourth of their size, oblong, and acute, with revolute and laciniated margins: they are appressed with their inner and keeled surface to the side of the calyx.

Stipules (f. 7) one to each pair of leaves, subquadrate, longer than they are broad, and wider than the stem, to which they are closely appressed: the margins are revolute, the apex emarginate, obtusely for the most part, but, as they approach the calyx (f. 8), they become larger, and more deeply and acutely emarginate, and the extreme or calycine one is bifid, with long, recurved, laciniated segments.

MALE FRUCTIFICATION situated upon lateral ramuli, so short, that, taken with the perigonial leaves, they are of a roundish figure, inclining to ovate; the leaves are, moreover, so remarkably convex or rather ventricose, that the margins, where they meet on the upper surface, are defined by a deep longitudinal groove or furrow. In each axilla are two or more spherical *anthers*, in every respect resembling those of *J. dilatata*.

BRITISH JUNGERMANNIÆ.

(*J. Tamarisci.*)

FEMALE FRUCTIFICATION always terminal upon short ramuli.

Calyx (f. f. 8. 9. 10) three-fourths of a line long, obovate, smooth, plane on its upper surface, below projecting with a blunt longitudinal ridge or angle: the mouth is formed by a long and acute tubular point, which divides into four equal segments for the escape of the capsule.

Calyptra (f. 11) obovate, or rather pyriform, yellowish-white, subcarnose, reticulated, tipped with a long *style* (f. 12), longitudinally and transversely striated; at the apex a little dilated.

Peduncle projecting a very short way beyond the calyx, white, succulent, vasculose.

Capsule (f. f. 9. 10) exactly spherical, of a pale reddish-brown or fulvous color, longitudinally furrowed. It divides into four equal, acute, ovate valves. Within, at the base, is seen the orbicular, semipellucid, greyish extremity of the footstalk, around which and upon its margin the valves appear to be situated.

Seeds and spiral filaments numerous, fulvous; the former (f. 14) are spherical, minute, tuberculated; the latter (f. 13) composed of a single *helix*, enveloped in a transparent tube, as is the case in *J. dilatata* and *J. Hutchinsiae*.

J. Tamarisci is by no means so common a species as the one last described. It inhabits more exposed situations, and is generally found on the ground, on low bushes, and rocks, most plentiful in heathy and sub-alpine districts; where it forms large straggling patches, conspicuous from their deep reddish-brown or purple color, which, however, it may be remarked, varies to a green in shady situations; and the whole of the under side of the plant, but more especially the auricles and stipules, are generally of a yellowish or brownish-green.

Under the description of *J. dilatata* I have mentioned the characters which will most readily help to distinguish the two species: to these I may add, that the present plant has a more pinnated ramification, and that its calyx is entirely destitute of tubercles. The fertile branches are always short; the perichætal leaves acute, strongly serrated, and, even before the appearance of the calyx, in those ramuli which are destined to produce it, this peculiarity is evident: in this state, however, the auricles do not seem to be so much lacinated (see f. f. 6. 6). Roth is the first person who has remarked this circumstance, and it is from his having done so, as well as from his description of the stipule, that I have been induced to refer his *J. dilatata* to my *Tamarisci*. Under the name of *J. tamaricifolia* he seems to have described *dilatata*. Lamarck, in the *Flore Française*, says that this species has "La gaine cylindrique, composée de feuilles dentelées," which is by no means the case; nor have I ever seen the capsule, as he observes, elsewhere, "d' un noir luisant."

Dillenius has well distinguished the habit of this species. "Tenuiores ac longiores," are his words, "ac *Lichenastrum imbricatum minus*, squamis convexo-concavis (*J. dilatata*) habet surculos, *Tamarisci Narbonensis* non absimiles, magis ramosos et magis liberos, a corticibus et saxis, quibus adnascitur, abscedentes, et plerumque pendulos, pluribus sibi incumbentibus, colore in junioribus et non florentibus plantis obscure viridi, in florentibus ut plurimum subfusco, rubiginoso, et atro-rubente." I have not observed, however, that the difference in color arises from the age of the plant, or that it depends upon its barren or fertile state.

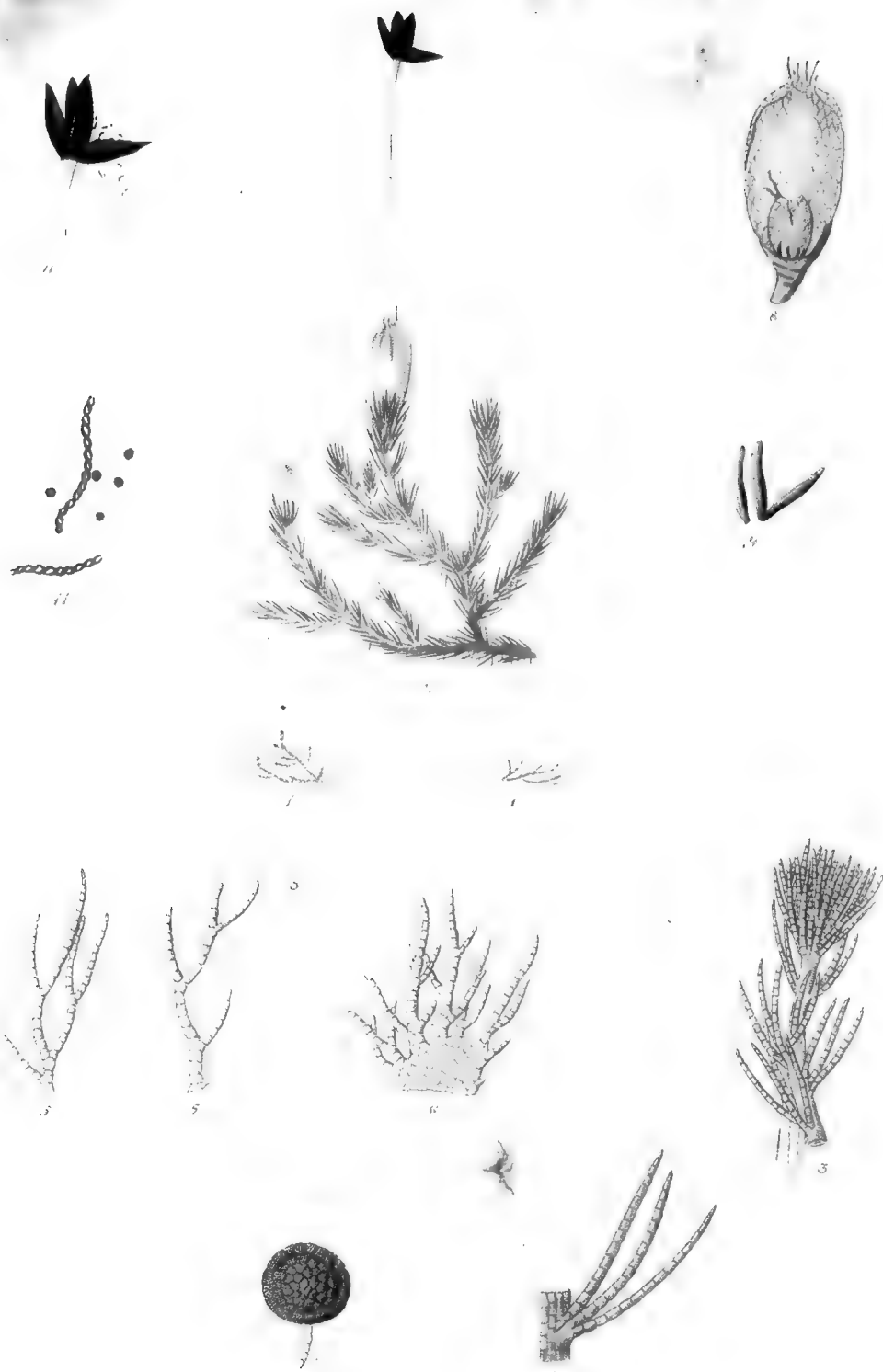
The male fructification of this species, as well as the last, was found by Mr. Lyell, at the same time and place as is described under *J. dilatata*. I shall, in a future number, have occasion to notice the anthers of *J. platyphylla*, also communicated to me by that gentleman. Except Micheli, I am not aware that any writer has taken notice of the male organs of these three species. In his work, the *Genera Plantarum*, they are figured of the natural size in a very satisfactory manner, but in the magnified representation the author has completely failed, and, indeed, does not appear to have seen, in any of the species, the filament of the anther. To those who are acquainted with Micheli's system, it will be needless to mention that this acute observer mistook the male fructification for the female; yet the error into which he has fallen has not prevented him from making many interesting discoveries, relative to the fructification of this genus of plants, and such as seem to have escaped the researches of almost every subsequent writer upon the subject.

Necker's *J. rubiginosa*, upon the authority of a specimen which Mr. Turner has received from Dr. Esper, is nothing more than our *J. Tamarisci*.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. Tamarisci</i> , barren plant, natural size.	
2. Fertile plant, natural size.	
3. The same magnified	6
4. Portion of a surculus	4
5. Leaf and auricle of a fertile shoot	2
6, 6. Perichæatial leaves	2
7. Stipule	2
8. Under side of part of a fertile branch	4
9. Upper side of the same, and capsule	4
10. Calyx, under side	3
11. Calyptra	2
12. Style	1
13. Spiral filaments, each in its tube	1
14. Seeds	1



Jungermannia trichophylla.
Stephanospora trichophylla (L.) Sacc.

BRITISH JUNGERMANNIÆ.

(*J. trichophylla*.)

JUNGERMANNIA TRICHOPHYLLA.

(TAB. VII.)

JUNGERMANNIA, surculo repente, vagè ramoso: foliis undique imbricatis, hinc illic fasciculatis, setaceis, articulatis, patentibus, rectis: fructu terminali; calycibus oblongis, ore contracto, ciliato.

Jungermannia trichophylla. LINN. *Sp. Pl.* II. p. 1601. *Syst. Nat.* II. p. 706. SCHRANK, *Baiersche Flora*. II. p. 500. SCHREBER, *Spic.* p. 109. HOFFMANN, *Germ.* II. p. 32. SCHRADER, *Spicil.* p. 154. WEIS, *Plant. Crypt.* p. 130. HUDS. *Angl.* p. 516. SCHMIDEL, *Icones*. p. 164. t. 42. OED. *Enum. Pl. Fl. Dan.* p. 42. WITH. III. p. 864. ROTH, *Germ.* III. p. 365. (excl. var. 3.) LINN. *Syst. Nat. ed. Gmel.* II. p. 1351. LAMARCK, *Encycl.* III. p. 285. *Engl. Bot.* t. 2252. LAMARCK, *Fl. Fr. ed. 2.* II. p. 437.

Musci Lichenoides capillaris et veluti cæspitosus. RUPP. *Jen.* I. p. 344. II. p. 293. (fide Dillenii.)

Lichenastrum trichodes, capitulis folliculis, e summitate ramulorum egredientibus, inclusis. DILL. *Giss.* p. 212.

Lichenastrum trichodes minimum, in extremitate florens. DILL. *Musc.* t. 73. f. 37.

Jungermannia minima, foliis capillariter multifidis. HALL. *Helv.* III. p. 63.

HAB. Turfy heaths, near North Brierly, Yorkshire. *Mr. Richardson*.—On Craigalleach and Schechallion, in Breadalbane, Perthshire; and on Ben Luyal, in the North of Sutherland.—About Bantry, Ireland. *Miss Hutchins*.—Near Belfast. *Mr. Templeton*.

PLANT growing in loosely-matted tufts, of some inches in diameter.

Root consisting of minute whitish fibres, proceeding here and there from the under side of the surculus.

Surculi creeping, from half an inch to an inch and a half in length, their thickness scarcely exceeding that of the human hair, sometimes simple, but mostly once or twice forked, the shoots beset with short, scattered, patent branches, which are often again divided.

Leaves growing in alternate clusters, each at a small distance from the other, so that the surculus is every where visible: these clusters * are composed of two or more, frequently three, but occasionally of five, and proceed from every side of the plant, particularly near the apices, where they form tufts or pencils (f. 3); but, when the plant is closely attached to the ground, the under side is bare of leaves, and, in such case, those which originate from the other parts of the surculus have a second appearance: the whole are erecto-patent, setaceous, straight, scarcely the eighth of a line long, of a yellowish-green † color, paler when dry, generally simple, but occasionally forked, or even branched (f. f. 5. 5), which is more particularly the case with those which form the terminal tufts: all of them are divided throughout their whole length with transverse dissepiments, forming joints, which are a little longer than they are broad, and perfectly cylindrical; when dry they are frequently alternately contracted, in the same manner as the joints of *Conferva capillaris* of Roth and *Conf. diffusa*, and the coloring matter either contracts into a dark green globule, in the centre of the joint, or is confined to the borders of the dissepiments, at the same time that the other parts of the leaf are quite pellucid.

Of the *perichatial leaves* (f. 6), the external are similar to those just described, the internal nearly ovate, entire at the base and for about a third of their length, thence cut into many branched capillary segments of various lengths.

MALE FRUCTIFICATION situated in the axillæ of those leaves which are collected into a tuft at the extremities of the ramuli (f. 3).

Anthers (f. 7) exceedingly minute, spherical, of an olive-green color, externally marked with reticulations; within containing a fine powdery mass, which gives the color to the otherwise transparent pellicle; they are supported upon a white, extremely delicate and pellucid, cylindrical filament, of nearly the length of the globule.

FEMALE FRUCTIFICATION terminal.

Calyx (f. 8) elliptical, inclining to obovate, about a half a line long, plicated, contracted at the mouth, where it is fringed with short cilia, which are sometimes bifid: its color is paler than that of the leaves, and more inclining to yellow; it is somewhat transparent, and its whole substance a tissue of small, oblong, compact cellules.

Calyptra ovate, very thin and delicate, reticulated, nearly white, tipped with a short style. *Abortive pistilla* linear-lanceolate.

Peduncle about a quarter of an inch long, pellucid, white, cellulose.

Capsule at first ovate, in maturity splitting into four equal, lanceolate segments, of a dark reddish-brown color, longitudinally and transversely furrowed.

* Schmidel says that the leaves are not always regularly clustered, for that an intermediate single one is occasionally to be found; and Roth goes farther, and observes of the plant, that, "variat foliis, licet rarissimè, solitariis." Of these I have seen no instances.

† Dr. Roth describes a variety sent him by Trentepohl of a dark-green color.

BRITISH JUNGERMANNIÆ.

(*J. trichophylla*.)

Seeds and spiral filaments fulvous; the former nearly spherical and smooth, the latter composed of a double *helix*, continuing to adhere to the margins of the valves of the capsule (according to Schmidel) in a pectinated manner, as in *J. setacea*, *bicuspidata*, and others.

Obs. In the middle of summer, or in autumn, if the weather was dry, Schmidel remarked at the extremity of the branches and in the bosom of the terminal leaves or on the apices, minute, globular, sessile, semi-transparent bodies, of the color of honey, which in a few days dissolved and totally disappeared. These, from their being seen at the same time with the young calyces, he was led to consider as the male fructification, a thing that it is scarcely necessary to say he would not have done, had he seen the antheræ here figured. I entertain little doubt of what he describes being *Gemmæ*, such as are found in the *Marchantiæ* and in other *Jungermannia*, also, in which both the male and female fruit are present.

Although, from the history of this elegant species of *Jungermannia* given by Schmidel, it appears to be widely scattered throughout Europe, being found from the Alps of Lapland to the Apennines, and covering in Germany whole rocks, yet, in Britain, it seems to be of rare occurrence, having been entirely overlooked in this country till the time of Hudson, who first published it in his *Flora Anglica*, upon the authority of specimens gathered in Yorkshire by Mr. Richardson. Since that period, however, it has been met with both in Scotland and Ireland; and from the latter country alone I have received fine specimens in fructification, gathered by Miss Hutchins. Roth's var. 3. of this species I have ventured to make a synonym to the following, *J. setacea*. The leaves described in this place, as well as by all preceding writers, as simple and clustered, might, perhaps, with more propriety, both in this and the following species, be considered as single and cleft to the very base into a number of segments; an opinion which is strengthened by the peculiar structure of the perichaetial leaves; for these appear to be composed of a number of cauline ones connected below, and having as many laciniae as there are leaves united. Dr. Smith has happily remarked that this species, in a dry state, is distinguished from the mosses among which it grows by its mucor-like appearance, arising from the minute capillary or setaceous leaves: in the form of these it agrees with no other British species of *Jungermannia*, except *J. setacea*, under the description of which will be found the characters that more particularly distinguish them.

Schmidel says that the female fructification is uncertain in point of situation, and he both figures and describes some calyces as growing on the middle of the surculus. I have in vain examined a great many specimens to see any thing similar, and I am led to suspect that he must either have confounded *J. trichophylla* and *setacea* together (which, from the pinnated ramification of some of his unmagnified figures, I still more incline to think the case), or that what he saw were old calyces, originally terminal, but then appearing lateral, on account of the elongation of a shoot, as I have myself not unfrequently remarked.

REFERENCES

(*J. trichophylla*.)

BRITISH JUNGERMANNIÆ.

REFERENCES TO THE PLATE.

FIG.

1, 1. <i>J. trichophylla</i> , natural size.	
2. Portion of a female plant, magnified	6
3. Portion of a ramulus, bearing antheræ	5
4. Leaves	4
5, 5. Terminal leaves	4
6. Perichæatial leaf	4
7. Anthera	1
8. Calyx	4
9. Abortive pistilla	1
10. Capsule discharging its seeds	3
11. Seeds and spiral filaments	1





Jungmannia selacea.

W. L. C. Webb.

BRITISH JUNGERMANNIÆ.

(*J. setacea*.)

JUNGERMANNIA SETACEA.

(TAB. VIII.)

JUNGERMANNIA, surculo repente, pinnatim ramoso: foliis undique imbricatis, binis, setaceis, articulatis, patentibus, incurvis: fructu terminali; calycibus oblongis; ore aperto, ciliato.

Jungermannia setacea. WEBER, *Spicil.* p. 155.

Jungermannia multiflora. HUDS. *Angl.* p. 510. LINN. *Mant.* p. 310. POLLICH, *Palat.* III. p. 182. OED. *Enum. Pl. Fl. Dan.* p. 41. LINN. *Syst. Nat.* ed. Gmel. II. p. 1450.

LAMARCK, *Encycl. Bot.* III. p. 282. WITH. III. p. 859.

Jungermannia sertularioides. LINN. *Suppl.* p. 449. *Meth. Musc.* p. 116. t. 4. f. 6. MICHAUX, *Bor. Am.* II. p. 278.

Jungermannia pauciflora. DICKSON, *Crypt. Fasc.* II. p. 15. t. 5. f. 9. LINN. *Syst. Nat.* ed. Gmel. II. p. 1349.

Jungermannia trichophylla, var. 3. ROTH, *Germ.* III. p. 366.

Lichenastrum multiflorum exile, foliis angustissimis. DILL. *Musc.* t. 69. f. 4. A. E. ?

HAB. Near Croydon. Mr. Dickson.—Holt Bogs, among *Sphagnum capillifolium*. Rev. R. B. Francis.—Mountains adjoining Lough Bray, near Dublin. Mr. D. Turner.—Bog, near Bantry. Miss Hutchins.—Bogs at Westleton, Suffolk.

PLANT sometimes forming dense tufts, but frequently growing almost singly in thick beds of *Sphagnum*, among which it is not uncommonly met with, drawn up, and affecting the same mode of growth as the moss.

Root a few minute, whitish, simple radicle^{ata} proceeding from nearly the whole length of the under side of the plant, especially near its base.

Surculi varying exceedingly in length, from two or three lines to nearly two inches, or even more, scarcely so thick as the human hair, creeping, generally once or twice irregularly forked, with segments of uncertain length, and irregularly pinnated with rather distant, short, patent branches.

Leaves rarely single, generally growing in pairs (f. 6), and sometimes, though seldom, three together (f. 7), placed at short distances from each other on every side of the plant, very minute, so that their form is imperceptible to the naked eye, not being much more than the twentieth of a line long; under a microscope they are found to

BRITISH JUNGERMANNIÆ.

be setaceous, patent, incurved, furnished, as in *J. trichophylla*, with transverse dissepiments, which form joints rather longer than broad, a little swollen in the middle, and often also divided by longitudinal septa, in a manner similar to that of the plants forming the division of the *Confervæ*, which Mr. Dillwyn has called "longitudinaliter venosæ": these dissepiments are visible also in the younger branches, but the old ones want them, and have the common cellular appearance of the genus. The color of the leaves, and, indeed, of the whole plant, is generally a pale yellowish green, darker, and even of an olive brown, when it grows in very shaded situations. In drying, the same disposition of the coloring matter appears as in *J. trichophylla*, and the leaves become much more incurved.

Perigonial leaves so thickly clustered upon short branches as to form a little spherical ball, very evident even to the naked eye. The *exterior* are for the most part simple; the *interior*, from a broad and expanded base, become, at the extremity, divided into a number of narrow laciniae of uncertain lengths; all of them incurved and lying closely imbricated over each other.

Perichætal leaves (f. f. 8. 8) equalling half the length of the calyx, to which they are closely appressed: all of them oblongo-ovate, and divided nearly to their base into several narrow, whitish, and sometimes branching, laciniae.

The MALE FRUCTIFICATION, which I have received from Mr. Lyell since the engraving of the plate was completed, differs from that of *J. trichophylla* in being situated upon extremely short lateral ramuli. The *Anthers* arise from the axillæ of the perigonial leaves. They are extremely small, ovate, approaching to round, when perfect of an olive-green color. The footstalk is about the length of the anther, white, pellucid, having numerous transverse septa, which are very evident under a high power of the microscope.

FEMALE FRUCTIFICATION lateral, sessile, or supported upon a very short footstalk.

Calyx (f. 9) very small, scarcely exceeding a quarter of a line in length, narrow at its base, then cylindrical, very pellucid, almost white, of an extremely thin and delicate texture, marked all over with oblong reticulations, which are large in proportion to the size of the calyx; the mouth is not at all contracted, but of the same width as the rest, cut into numerous long erect cilia.

Calyptra (f. 10) ovate, white, thin and delicate, marked with roundish reticulations; at the base surrounded by five or six almost linear, greyish, abortive pistilla.

Peduncle rather more than a quarter of an inch long, pellucid, delicate, vasculose.

Capsule ovate, deep brown, opening into four equal, ovato-lanceolate, transversely and longitudinally furrowed valves.

Seeds and spiral filaments (f. 12): h of them in every respect resembling those of *J. trichophylla*: many of the ^{bo} continue to adhere in a similar manner to the margins of the valves of the capsule (f. 11), a circumstance not uncommonly observable in many species of this genus.

BRITISH JUNGERMANNIÆ.

(*J. setacea*.)

Oss. In the month of February I have found *Gemmæ* abundantly scattered among the terminal leaves, minute, variously shaped, but always more or less angular (f. 5), pellucid, of a pale greenish color, inclining to brown.

Few *Jungermanniæ* seem to have been less understood by Cryptogamic Botanists than the present, which is not surprising, if we consider the great similarity that exists between it and *J. trichophylla*, especially in barren specimens. In such case the most obviously distinguishing characters are its shorter leaves, placed more distantly and in pairs, and strikingly incurved, so that the plant altogether wants the mucor-like appearance, pointed out by Dr. Smith as characteristic of the other species; but most of these circumstances are liable to some variation in different situations. In fertile specimens, indeed, no difficulty will be found to occur; the extremely delicate calyx, its lateral situation, and its long laciniae being remarkable on the slightest examination with the microscope.

The specific name of *multiflora* was, in all probability, imposed upon this plant by Hudson, in consequence of the numerous footstalks represented in the Dillenian figure here quoted, and has in point of priority a right to be retained; but, as not only that engraving (although cited by Hudson and Linnæus), but also the original drawing in Sir Joseph Banks' library, are extremely unlike our present plant, and especially as this species, in consequence of the paucity of its flowers, has been thought, by another eminent botanist, deserving of a name directly the reverse in its meaning, that of *J. pauciflora*, I have considered it best to do away an appellation which can only tend to mislead, and to substitute in its room the very appropriate one adopted by Weber. It is, indeed, merely in compliance with the opinion of preceding botanists, and contrary to my own, that I here refer to the Dillenian figure, which appears most like a very common appearance of *J. bicuspidata*, and was considered by Weber as so doubtful, that he quotes it under *J. setacea* with a mark of uncertainty. I was in hopes of ascertaining the fact by examining the specimen corresponding with the number in the Dillenian Herbarium; but, to my great disappointment, what is there preserved is an injured morsel of *J. connivens*, Dicks., a plant to which neither the figure nor description bears the smallest resemblance! It appears to admit of no doubt but that Dr. Roth, who is in general most accurate, and many other botanists, have confounded this species with *J. trichophylla*; and even the acute Ehrhart, who, by his close attention to the genus *Jungermannia*, has added several new species to the catalogue, and assisted our investigation with many interesting observations on their structure, at the same time that he seems to have known the present plant under the name of *multiflora*, was not conscious of the difference between it and *J. trichophylla*. He has consequently fallen into an error in his *Beiträge*, which renders his severe remark on the Swedish botanists in that place the less excusable. "*J. trichophylla* Linn. Sp. (he says*) *J. multiflora* Linn. Mant. and *J. sertularioides* Linn. Sw. Meth. are all three one and the same plant, whatever may be said against it. But is it not singular that the Swedes, who would wish to lord it over the whole vegetable kingdom, and over the botanists of all parts of the world, do not know the plants of their own country?"

* *Beiträge*, 11. p. 46.

(*J. setacea*.)

BRITISH JUNGERMANNIÆ.

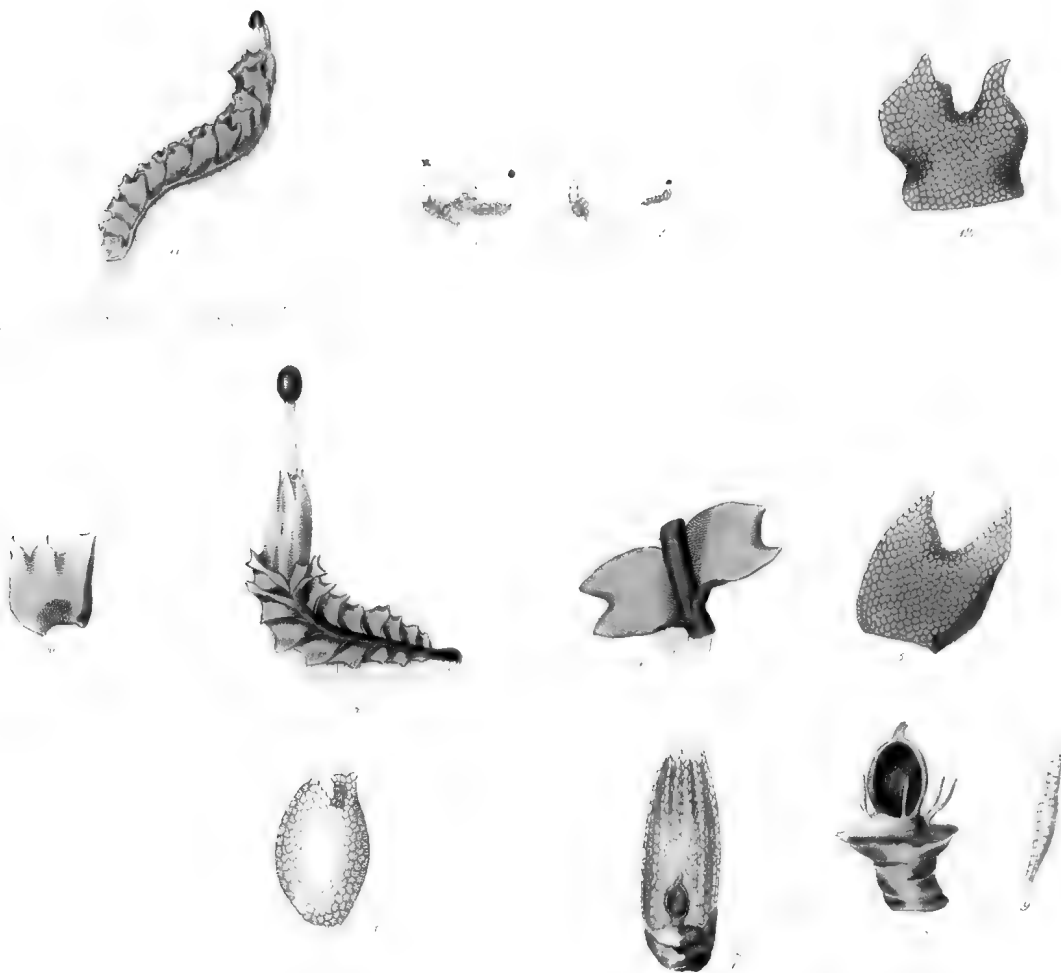
I have quoted under this, rather than under *J. trichophylla*, *J. sertularioides* of the *Methodus Muscorum*, on account of the lateral calyces, although the author has remarked "a *J. setacea* WEB. (*multiflora* DILL. et LINN.) differt foliis capillaceis, æqualibus, articulatis." The leaves, however, of both the one and other are rather setaceous than capillary. The same observation is equally applicable to the synonym of Michaux, as, indeed, must be the case with almost every author, who attempts to describe these minute vegetables within the compass of a few words or sentences.

The leaves of this *Jungermannia*, though not in reality verticillate, have the appearance of being so, from the circumstance of their growing on all sides of the surculus, and the general resemblance of both *J. setacea* and *J. trichophylla*, under the microscope, to *Conferva verticillata* is worthy of remark.

REFERENCES TO THE PLATE.

FIG.

- | | |
|--------------------------------------------------------|---|
| 1. <i>J. setacea</i> , fertile specimen, natural size. | |
| 2, 3. Barren plants, natural size. | |
| 4. Portion of a female plant, magnified | 6 |
| 5. Portion of a ramulus bearing gemmæ | 5 |
| 6, 7. Leaves | 4 |
| 8. Perichætial leaves | 4 |
| 9. Calyx | 5 |
| 10. Calyptra | 3 |
| 11. Capsule discharging its seeds, and filaments | 2 |
| 12. Seeds and spiral filaments | 1 |
-



Jungermannia excisa.

JUNGERMANNIA EXCISA.

(TAB. IX.)

JUNGERMANNIA, caule prostrato, simpliciusculo: foliis patentibus, subquadratis, profundè emarginatis: fructu terminali; calycibus oblongis, albidis; ore plicato, dentato.

Jungermannia excisa. DICKS. *Crypt. Fasc.* III. p. II. t. 8. f. 7. WITH. III. p. 861. HOFFMANN, *Germ.* II. p. 82.

Jungermannia globulifera. ROTH, *Germ.* III. p. 379?

β. CRISPATA; foliis longitudinalitèr undulatis; segmentis inæqualibus, crispatis.

HAB. In most shady woods. *Mr. Dickson.*—On Holt and Edgefield Heaths, in wet places, plentiful. *Rev. R. B. Francis.*—Abundant upon Moushold Heath, near Norwich, and on hedge-banks and heathy places, near Yarmouth.—On the highland mountains of Scotland.—β is not uncommon in similar situations with α.

This minute PLANT is found in scattered patches, sometimes covering several inches of surface, firmly adhering to the soil by means of the numerous, simple, pellucid, fibrous radicles.

The *Stems*, which are usually dark green, though sometimes inclining to deep brown or black, vary considerably in their extent, from half a line to five or six times that length, and are about the tenth of a line in diameter, throughout cylindrical, simple, or here and there producing a lateral shoot.

Leaves (f. 4, 5) a quarter of a line long, rather closely placed, patent or horizontal, (erect in var. β.) subquadrate, approaching to orbicular, slightly concave, semi-amplexicaul at the base, at the extremity deeply emarginate, with an obtuse sinus, the segments acute, strait, and equal in size: the color is rather a deep green; the *reticulation* small, and formed by cellules of a roundish figure.

The *perichæatial leaves* (f. 6) differ from the rest only in being most frequently tridentate.

MALE FRUCTIFICATION I have not been able to discover.

FEMALE FRUCTIFICATION terminal, most abundant upon such plants as are going into a state of decay.

(*J. excisa*.)

BRITISH JUNGERMANNIÆ.

Calyx (f. f. 3. 7) nearly a line long and three-tenths of a line in diameter, oblong, cylindrical at the base, above longitudinally plicate; the *mouth* scarcely at all contracted. *Color* a very pale whitish green, diaphanous and scariose at the extremity: near the middle it is frequently marked with a faint purple ring, which sometimes, and more especially in alpine regions, is seen to tinge nearly the whole of the calyx.

Calyptra (f. 10) ovate, pellucid, whitish, reticulated; *style* short. A few linear-lanceolate *sterile pistilla* surround the germen (f. f. 8. 9).

Peduncle a line or a line and a half long, white, succulent, cellulose, terminated by the ovato-subrotund, deep brown

Capsule, which divides into four equal ovate valves.

Seeds and *spiral filaments* red brown, the former exactly spherical, the latter composed of a double *helix*.

In the var. β . (f. 11, 12) the leaves are almost constantly erect, more crowded, longitudinally undulated and plicate, with the segments of unequal size, curled and distorted.

J. excisa, which was first noticed by our excellent cryptogamist, Mr. Dickson, seems to be by no means of rare occurrence in this country, and during the season of fructification is rendered more conspicuous by the large diaphanous calyx than by the foliage. The purple tinge is most frequent in exposed situations, but is often altogether wanting. The form and size of the calyx (in proportion to that of the plant itself), afford the most striking marks of distinction between this and small specimens of *J. ventricosa*; for, in the leaves, I am unable to point out any marks of separation. From *J. incisa*, indeed, with which it accords in size and general habit, the shape of the leaves will furnish a sufficient difference, although Hoffmann, in his *Flora Germanica*, seems to have confounded the two: at least he applies to the stems of this species the words "*apice incrassato*", and in another place he describes them as "*subcompressæ*", peculiarities which are remarkable in *J. incisa*, but, not that I have ever observed, in the present plant. Roth has, with a mark of interrogation, quoted Hoffmann's synonym to his *J. byssacea*, than which no two plants can be more unlike. The same author appears to have united with his *J. globulifera* not only Mr. Dickson's *J. ventricosa*, and Schmidel's *J. exsecta*, but, judging from some part of his description, the present is also included in the number. His character of the calyx, which, however, has not appeared to me, in any part of it, to be constantly obsoletely triangular, in other respects so well accords with this species, that I shall transcribe his words. "*Calyx pallidè viridis, plicatus, obsoletè triangulus, ex oblongo ovatus, ultra lineam, fere sesquilineam longus, apice truncatus, albidus, membranaceus, laciniatus, primo intuitu in cæspite sessilis, tamen semper in cauliculis centralibus terminalis, quorum longitudinem non raro superat.*"

REFERENCES

BRITISH JUNGERMANNIÆ.

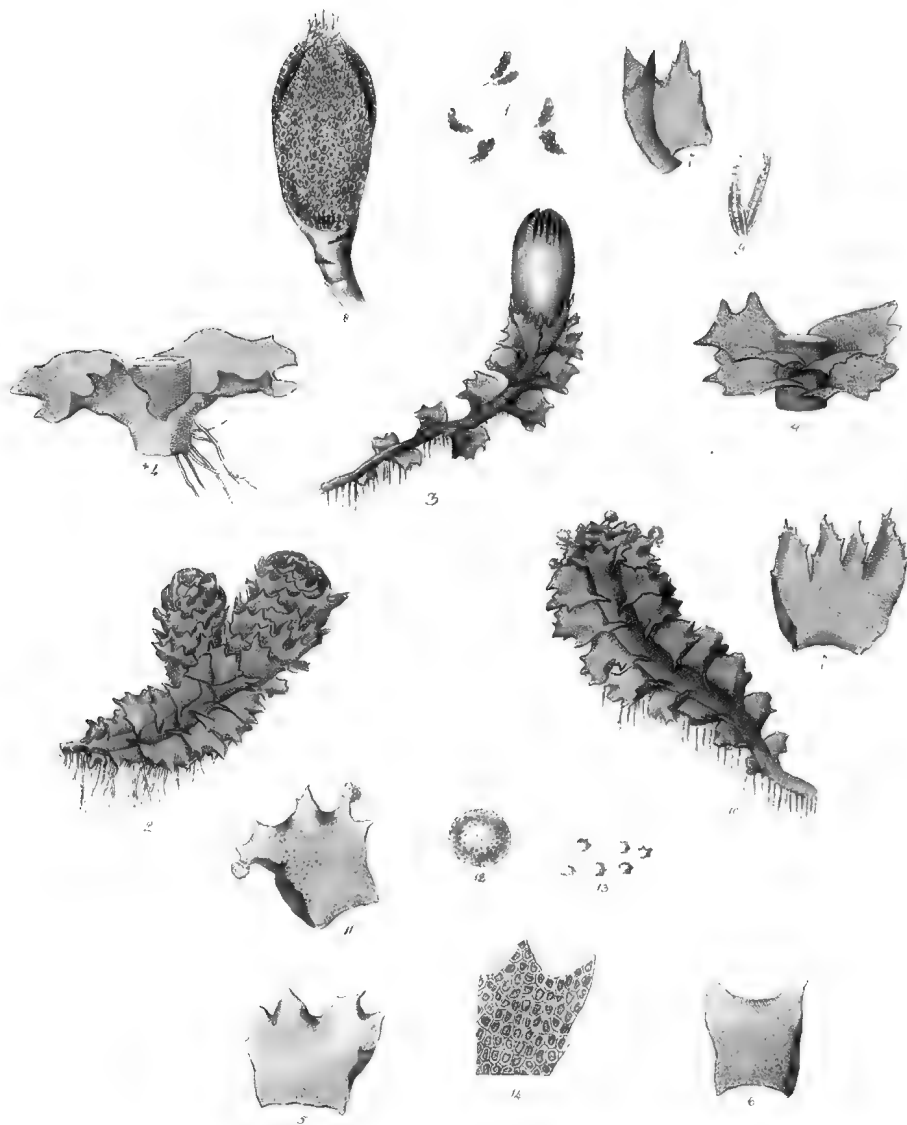
(*J. excisa.*)

REFERENCES TO THE PLATE.

FIG.

1.	<i>Female plant of J. excisa, natural size.</i>	
2.	<i>Var. β. natural size.</i>	
3.	<i>Female plant, magnified</i>	6
4.	<i>Portion of the stem and leaves</i>	4
5.	<i>Leaf</i>	2
6.	<i>Perichæatial leaf</i>	4
7.	<i>Longitudinal section of the calyx</i>	4
8.	<i>Receptacle, with the germen and barren pistilla</i>	3
9.	<i>Barren pistillum</i>	1
10.	<i>Calyptra</i>	2
11.	<i>Var. β.</i>	6
12.	<i>Leaf of var. β.</i>	2





Jungermannia incisa.
Leptocarpus incisa (Lamour.) Lamour.

BRITISH JUNGERMANNIÆ.

(*J. incisa.*)

JUNGERMANNIA INCISA.

(TAB. X.)

JUNGERMANNIA, caule prostrato, depresso, simpliciusculo; foliis subquadratis, undulatis, subtrifidis, segmentis inæqualibus, hic illic denticulatis: fructu terminali; calycibus obovatis; ore contracto, lacerato.

Jungermannia incisa. SCHRADER, *Samml.* II. p. 5. ROTH, *Germ.* III. p. 381.

Jungermannia foliis laceris, multidentatis, sessilibus. HALL, *Helv.* III. p. 59. n. 1862.

HAB. Holt Lows and Edgefield Heath. *Rev. R. B. Francis.*—Herringfleet, near Yarmouth. *Mr. D. Turner.*—Rocky places upon Ingleborough, Yorkshire.—Near Bantry, Ireland. *Miss Hutchins.*—Lambeg Bog, Ireland. *Mr. Templeton.*—Found in fructification near Croydon, Surrey, in July, 1811, by *Mr. Dickson.*—Bogs, Westleton, Suffolk.—(It delights chiefly in moist places, and is often found among *Sphagna* and other mosses.)

PLANT forming small, but very dense patches of a pale green color; the surface appearing exceedingly beautiful from the numerous crisped and dentated leaves, resembling in miniature a tuft of lettuces. It firmly attaches itself to the ground or moss upon which it grows by means of its abundant fibrous *radicles*, which proceed from the whole length of the under side of the stem, and are much entangled and matted together.

The *stems*, which are prostrate, about a quarter of an inch long, and cylindrical at the base, gradually become wider towards the extremity, where they are depressed, and equal the sixth of a line in diameter; in general they are quite simple, though sometimes furnished with a small ramulus: their *color* is a very pale and pleasant green.

Leaves (f. f. 3. 5. 11) at the base of the stem rather distantly placed, the rest more approximated, at the extremity of the barren plants frequently forming thick tufts or heads; they are subquadrate, longitudinally undulated, at the base semi-amplexicaul and decurrent, the anterior margin a little involute, the apex tri or quadridentate; but here and there a lower leaf (f. 6) is seen to be only emarginate: the segments are of unequal sizes, crisped and distorted; their margins very frequently dentate with one or two small teeth. The *color* of the leaf is an extremely pale green, approaching that of *J. tomentella*. The *reticulation* (f. 14) is pellucid, the cellules opaque, roundish.

(*J. incisa*.)

BRITISH JUNGERMANNIÆ.

The *perichætal leaves* (f. 7) are trifid or quadrifid, the segments more equal in size than those of the cauline leaves, and more frequently and regularly denticulate.

MALE FRUCTIFICATION I have never seen.

FEMALE FRUCTIFICATION terminal upon the stems.

Calyx (f. 8) obovate, about half a line long, and plicate: towards the extremity the mouth is contracted, small and toothed or lacerated. In *color* and *texture* it exactly resembles the leaves.

Calyptra obovate, whitish, reticulated, terminated by a short tubular *style*.

Peduncle scarcely measuring twice the length of the calyx, white and cellulose.

Capsule, *seeds*, and *spiral filaments* exactly as in *J. excisa*.

Obs. Upon the terminal leaves of this *Jungermannia*, towards the latter end of December, are situated *Gemmæ* (f. f. 10. 11. 12. 13), collected together in a small, pale, yellowish-green, spherical mass; but in the middle of January they are, for the most part, dispersed about the plant in the form of a minute powder. Each particle is semi-transparent, and under a microscope appears somewhat spherical in its outline, but beset with a number of acute, projecting angles (f. 13).

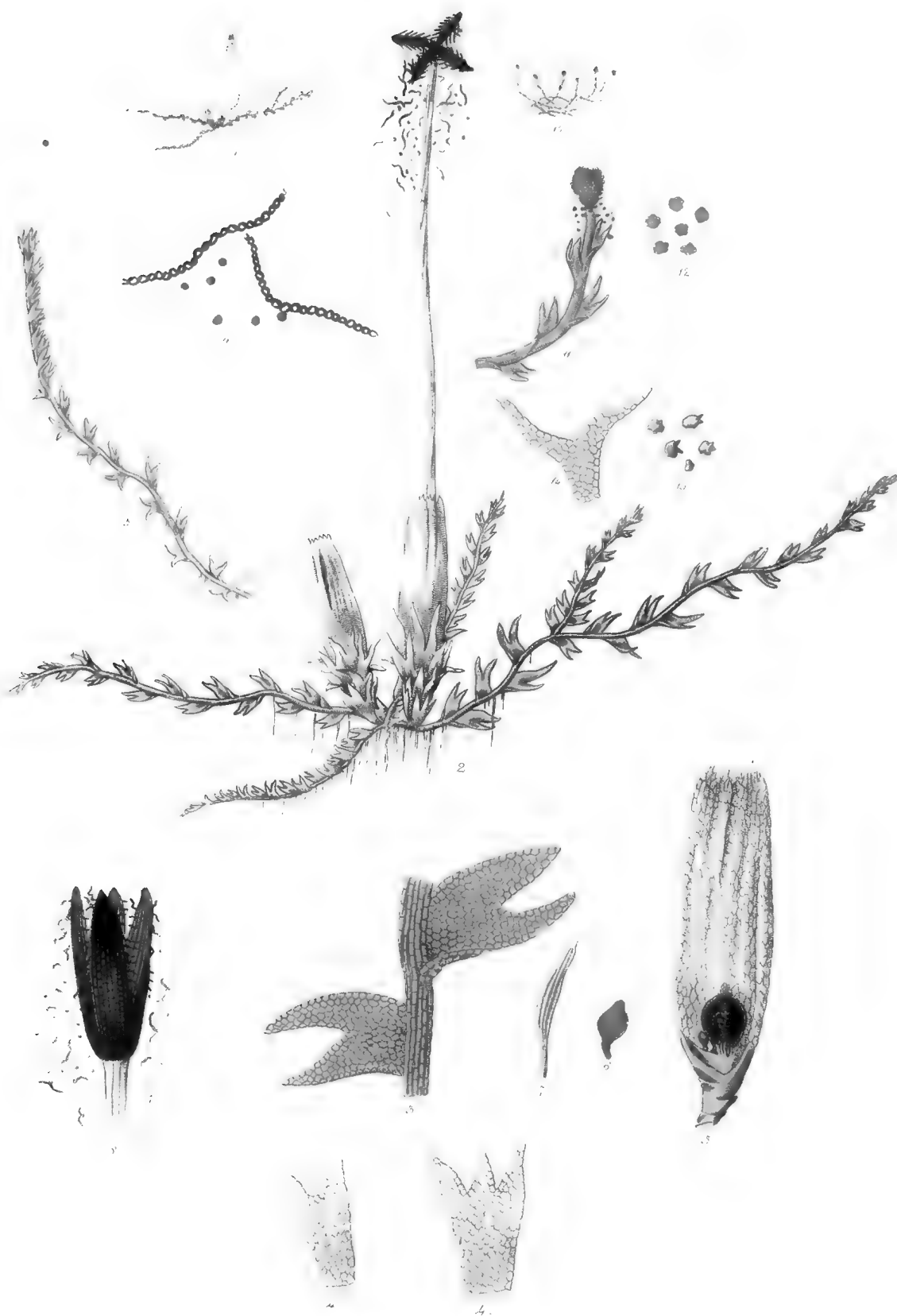
Haller is the first author who seems to have noticed this species, to which the name of *incisa* was applied by Schrader in his *Systematische Sammlung Kryptogamischer Gewächse* in the year 1796. In the British dominions it has for many years been known to Mr. Francis as an inhabitant of heathy places in the neighborhood of Holt; and this gentleman has long preserved among his manuscripts a figure and description of it, under the appellation of *J. depressa*. Subsequent to its discovery by Mr. Francis it has been ascertained to be also a native of Ireland and Yorkshire, and during the last summer, 1811, when the engraving of the plate was completed, ripe capsules were brought to me by Mr. Dickson, which he had been fortunate enough to find near Croydon, in Surrey. *Jungermannia excisa*, as has been already remarked, bears the greatest affinity with the present plant, but the undulated and almost universally tridentate leaves, together with the compressed stem, are circumstances which will readily distinguish *J. incisa* from that, as well as from every other species of the genus.

Dr. Roth's description of *J. incisa* accords so well with our British plant that I feel no hesitation in adopting his synonym; but he appears to have fallen into a strange mistake, when he says, "Huic (*J. incisæ*) proximè accedit, nisi eadem sit, '*Jungermannia bicrenata* fronde simpliciter pinnatâ, foliis bidentatis; floralibus plicatis.' SCHMIDEL, *Icon. et Analys. tab. 64. f. 1.* Habitus totius plantæ sanè idem cum nostrâ, quamvis folia constantèr bisecta dicantur, quæ in nostræ regionis plantis nunc bi nunc et plerumque trifida observantur!" In another place the same author expresses a doubt whether *J. incisa* be really distinct from his *J. globulifera*, a species, which, as has been observed elsewhere, appears to me to include *J. excisa*, *J. ventricosa*, and *J. exsecta*.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. incisa</i> , natural size.	
2. Barren plant of the same, magnified	6
3. Female plant	6
4. Portion of stem and leaves	4
4*. Ditto	3
5. Single leaf	3
6. Lower leaf	3
7, 7. Perichæcial leaves	3
8. Longitudinal section of a calyx	3
9. Barren pistilla	1
10. Plant with the gemmæ	6
11. A leaf with gemmæ	3
12. Gemmæ in their most perfect state, before dispersion, collected into a spherical mass	2
13. Gemmæ when dispersed	1



Jungermannia bicuspidata.

L. 27

JUNGERMANNIA BICUSPIDATA.

(TAB. XI.)

JUNGERMANNIA, surculo procumbente, flexuoso, stellatim ramoso; foliis subquadratis, incis, segmentis acutis: fructu radicali; calycibus oblongis, plicatis; ore dentato.

Jungermannia bicuspidata. LINN. *Sp. Pl.* II. p. 1589. *Syst. Nat.* II. p. 705. POLLICH, *Pal.* III. p. 282. LEERS, *Herb.* p. 250. ALLIONI, *Fl. Ped.* II. p. 312. WEIS, *Plant. Crypt.* p. 117. WEBER, *Spic. Fl. Goet.* p. 136. WILLD. *Ber.* p. 341. OEDER, *Enum. Pl. Fl. Dan.* p. 41. SCHREBER, *Spic. Fl. Lips.* p. 105. ROTH, *Germ.* III. p. 384. (excl. syn. *Web. Michel. Leers, et Dill. t. 31. f. 6.*) HOFFMANN, *Germ.* II. p. 89. SCHMIDEL, *Icones.* p. 244. t. 63. SCHMID. *Diss. Jung. f.* XVI. RELHAN, *Cant.* p. 438. HUDS. *Angl.* p. 511. LIGHTF. *Scot.* II. p. 775. LAMARCK, *Encycl. Bot.* III. p. 280. WITH. p. 855. (excl. syn. *Engl. Bot.*) LINN. *Syst. Nat. ed. Gmel.* II. p. 1349. LAMARCK, *Fl. Fr. ed. 2. v. II.* p. 429. *Engl. Bot. t.* 2239. (non t. 281.)

Jungermannia globulifera. POLLICH, *Pal.* III. p. 182?

Jungermannia sphaerocephala. ROTH, *Germ.* I. p. 481.

Jungermannia fissa. SCOP. *Carn. ed. 2. n.* 1345. (fide ROTH II.)

Jungermannia bicornis. *Fl. Dan. t.* 888. a. (non b.)

Lichenastrum Trichomanis facie, foliolis bifidis, minimum. RAI *Syn.* p. 113. n. 20.

Jungermannia minima repens, foliis bifidis, vagina florum cylindracea. MICHEL, *Nov. Gen. p. 9. t. 6. f. 17.*

Lichenastrum pinnulis acutissimè bifidis, minimum. DILL. *Hist. Musc. t. 70. f. 13.*

Jungermannia foliis distichis bicuspidatis, summis ramis globuliferis. HALL. *Helv.* III. p. 59. 1865.

Jungermannia foliis bifidis ex medio caule crebro florifera. HALL. *Helv.* III. p. 62. 1878.

β. PATENS; foliorum segmentis patentibus.

HAB. Extremely common on moist hedge-banks and on heaths, producing fructification most profusely in the early part of spring.—β in marshy places, growing among *Sphagna*.

(*J. bicuspidata*.)

BRITISH JUNGERMANNIÆ.

PLANT growing in large tufts, loosely attached to the soil by means of the fibrous roots, which proceed from every part of the surculi, but especially towards their base.

Surculi filiform, flexuose, an inch or an inch and a half long, divided in a somewhat stellated manner, so that the branches for the most part unite in the centre of the plant; they, however, occasionally throw out other short, scattered, patent ramuli: all are of a pale green color and semipellucid, the substance delicate, succulent and composed of large oblong cellules.

Leaves (f. 3) rather distantly placed, patent, or sometimes erect, scarcely a quarter of a line in length, oblongo-quadrate, divided for rather more than one third of the way from the extremity, by an acute sinus, into two lanceolate acute and equal segments, which are now and then a little incurved, and I have in a few instances observed them to be recurved: the color exactly resembles that of the stem, a pale pellucid green; the cellules are more approaching to round, forming a large and elegant reticulation, their surface is slightly convex.

The *perichæatial leaves* (f. f. 4. 4) are numerous, and surround the base of the calyx, growing closely imbricated. The *interior* are the largest, and generally divided into two acute segments; the *exterior* are frequently trifid, and have their points not uncommonly recurved: they are of a pale whitish-green color.

MALE FRUCTIFICATION at present unknown.

FEMALE FRUCTIFICATION arising from the base of the surculi, where the radicles are the most numerous.

Calyx (f. 5) situated upon a short proper footstalk, which is covered by the perichæatial leaves, a line or a line and a half long, oblong, scarcely at all inclining to ovate, nearly white, scariose, longitudinally plicate; the *mouth* irregularly dentated: it is elegantly reticulated, and has ovate areolæ. These calyces remain long after the decay of the capsule and footstalk, and then become tinged with brown.

Calyptra ovate, a thin, delicate, whitish, reticulated membrane, tipped with a short style, having at the base numerous linear-lanceolate, barren pistilla (f. 7), which I have seen accompanied by what appears to be an abortive germen (f. 6), ovate, with a contracted base and an acuminate point, throughout of an olive-brown color.

Peduncle three quarters of an inch in length, or sometimes more, white, cellulose, terminated by the

Capsule (f. 8) which is oblongo-ovate, deep brown, longitudinally and transversely furrowed.—Shortly after the peduncle has reached its greatest height the four valves of the capsule separate, and the numerous roundish

Seeds are discharged, together with many of the double spiral filaments (f. 9): some of these, indeed, remain attached to the margin of the lanceolate valves in a pectinated form, pointing, however, obliquely and forming an acute angle with the valve (v. f. 2): thus they continue till the margins of the valves become involute, which soon takes place, if the atmosphere is dry. Both seeds and spiral filaments are of a reddish-brown or chocolate color. In the winter season (or in the autumn, more frequently, according to Schmidel), the ends of the surculi of many of the sterile plants become erect, having leaves very distantly placed, especially towards the

BRITISH JUNGERMANNIÆ.

(*J. bicuspidata*.)

extremity, in which case the apex itself supports a cluster of *Gemmæ* (f. 11) collected into a spherical mass* of a pale yellow color. These in a few weeks dissolve and disappear. Under a high magnifying power each particle (f. 12) appears semi-transparent, very irregular in its figure, and always more or less angular. These *gemmæ*, which Schmidel has represented less angular than I have ever observed them to be, are regarded by that author as the male fructification.

My *Var. β* (f. 13) is perhaps scarcely worthy of being noticed as a distinct variety. I found it lengthened out and much exceeding its usual size among *Sphagna*. The greater number of leaves had the segments divaricating (f. 14) in a manner that appeared rather to arise from accident than to be the natural growth of the plant. In specimens of this kind I remarked *gemmæ*, loosely collected together in the axillæ of the terminal leaves, which precisely corresponded with those just described as forming a globule at the extremity of the surculus.

Few species of *Jungermannia* are more generally diffused throughout the temperate parts of Europe, than the present. It may be seen in almost every wood, as well as on every moist hedge-bank and damp heath. In the latter situation, especially, its whitish scariose calyces, which are so plentifully produced, may be found at almost all seasons of the year. Its size and color, as well as the situation of the calyces, will prevent its being confounded with *J. byssacea*, and there is no other species that I am acquainted with for which it can at any period of its growth be mistaken. I have had occasion to observe, while describing another species (*J. setacea*), that the Dillenian figure (*Hist. Musc.* t. 69. f. 4. A. B.) was probably intended for this plant, though subsequently taken up by Hudson and Linnæus as a new one, under the name of *multiflora*; and I am happy to add in confirmation of this opinion that of Schmidel, who considers it to be the same as a variety which he had discovered “in quo surculi satis longi foliis alternis instructi fuerunt, quorum foliorum forma admodum angusta, et incisuræ adeo parùm conspicuæ, vel adeo propinquæ, ut pro indivisis primò intuitu potuerint haberi: curatissimè vero considerata, et versus inferiora verè bifida folia, et ejusdem indolis ut hæc species habere solet.” It may not be improper here to repeat that neither the *J. multiflora* of Linnæus (*J. setacea* of this work) nor *J. bicuspidata*, in the least accord with the original specimen in the herbarium at Oxford, which is *J. connivens*. The figure, however, is accurately copied from the Dillenian drawing, in the possession of Sir Joseph Banks.

The following observation from so accurate an investigator as Schmidel is too important to be omitted, and, as I have not had the opportunity of confirming the existence of what

* *Gemmæ*, collected into a similar mass, and in like manner situated upon the extremity of the surculi, are found upon *Jungermannia Trichomanis*. From this circumstance I imagine Dr. Roth has been led into an error in quoting as synonyms of this species the figures and descriptions of *Micheli*, p. 8. t. 5. f. 14. and *Dill.* p. 237. t. 31. f. 6. which evidently belong to *J. Trichomanis*, though the calyx represented by Micheli bears no resemblance to that of either of the plants in question.

he saw, I shall offer no apology for transcribing the whole of his remark. "In varietate hujus (*J. bicuspidatæ*) mense Novembri et Decembri reperi capitula pulverulenta, quæ, summè aucta, corpuscula oblonga aut obversè ovata tota comprehendit; quæ aliquamdiu in aquâ relicta figuram mutaverunt in sphæricam, et, ut distinctè vidi, parvas moleculas subrotundas dimiserunt, non verò magnâ copiâ. Inter alia unum corpusculum post aliquot confinium explosionem solutum est, et formam quidem retinuit, parvam aliquam moleculam (fortè ab alio corpusculo profectam), ad latus habens; subitò autem hoc majus corpusculum in motum actum atque in longum protrusum est, ita ut illud ex foco perderem, nec amplius reperirem." *Schmidel, Icones.* p. 247.

Haller's description, n. 1865, does not so well agree with our plant as his n. 1878, but he tells us that the former is the same as Schmidel's plant, *Diss. Jung.* f. 16.

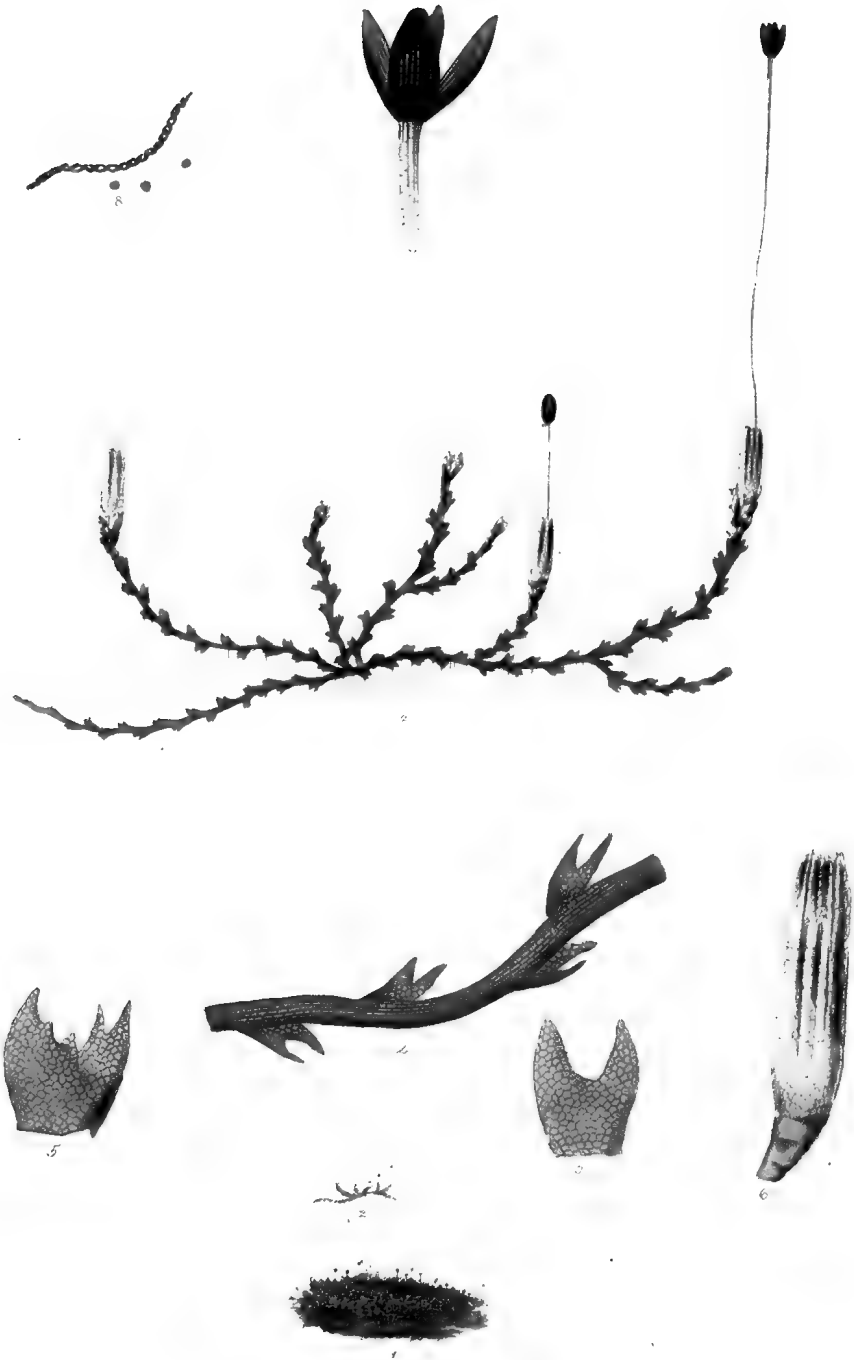
Ehrhart's *J. bicuspidata* (*Crypt.* 292) which I have never seen, Dr. Smith assures us, is a very different plant from the present, and more like that figured in *Engl. Bot.* t. 281, which I formerly supposed was only a variety of *J. bidentata*, but which I am now inclined to accord with Mr. Francis and Dr. Schrader in considering a distinct species; though very closely allied to it. It is *J. heterophylla* of Schrader's *Systematische Sammlung*.

J. bicuspidata, *J. byssacea*, *J. connivens*, and *J. curvifolia* form a very natural family, agreeing in general habit and in their ramification, which has always more or less of a stellated appearance, in consequence of the fruit originating from the centre of the plant, and the branches diverging on all sides nearly equally.

REFERENCES TO THE PLATE.

FIG.

1. A single female plant of <i>J. bicuspidata</i> , natural size	
2. The same magnified	6
3. Portion of the stem and leaves	4
4, 4. Exterior and interior perichæatial leaves	4
5. Calyx longitudinally dissected	3
6. Abortive germen	2
7. Barren pistillum	1
8. Capsule opening and discharging its seeds	2
9. Seeds and spiral filaments	1
10. Gemmiferous plant, natural size	
11. Extremity of a surculus of the same, magnified	4
12. Gemmæ	1
13. Var. β , portion of	4
14. Leaf of the same	3
15. Gemmæ of var. β	1



Jungermannia byssacea.
Stam. et Pist. in Hook. & Grev.

BRITISH JUNGERMANNIÆ.

(*J. byssacea*.)

JUNGERMANNIA BYSSACEA.

(TAB. XII.)

JUNGERMANNIA, surculo procumbente, flexuoso, stellatim ramoso: foliis subquadratis, incisis, segmentis acutis: fructu terminali; calycibus oblongis, plicatis, ore dentato.

Jungermannia byssacea. ROTH, *Cat. Bot.* II. p. 158. ROTH, *Germ.* III. p. 387. (*excl. syn. Hoffmanni.*)

Jungermannia bifida. SCHMIDEL, *Icones.* p. 250. t. 64. f. 2. et t. 62. f. 2. 19. et 20. (*planta gemmifera.*)

Jungermannia divaricata. Eng. Bot. t. 719.

HAB. First discovered in this country, by the *Rev. R. B. Francis*, on heathy and exposed situations in the neighborhood of Holt.—Far from uncommon in similar places in various parts of Norfolk and Suffolk.—*Mr. Dawson Turner* finds it growing in great profusion, but always barren, on the sand-hills at Hemsby, near Yarmouth.—Near Bantry in Ireland. *Miss Hutchins.*—About Belfast. *Mr. Templeton.*—On the Scotch mountains, by no means of rare occurrence.

PLANT most frequently growing in dense tufts or pulvinuli, conspicuous from their dark green, and frequently almost black color.

The *surculi*, which may be reckoned among the smallest of any of the genus, are scarcely so thick as the human hair, and not more than two or three lines in length, throughout filiform, somewhat rigid, branched, like *J. bicuspidata*, in a kind of stellated form; the branches often again divided, and procumbent, but the fertile ones pointing upwards at the tips: their *color* varies from an olive-green to a dark brown; the latter is the most usual appearance.

Leaves (f. 4) distantly placed, though occasionally clustered at the extremity of a surculus, yet in general so small that without great care, even under a microscope, the plant appears almost leafless: they do not exceed the tenth of a line in length, are appressed or patent, subcarnose, in figure nearly quadrate, at the base semiamplexicaul, at the extremity divided for about one third of their way by a rather obtuse sinus;

(*J. byssacea*.)

BRITISH JUNGERMANNIÆ.

the segments are acute, occasionally a little spreading, which induced Dr. Smith to adopt, in *English Botany*, Mr. Francis' manuscript name of *divaricata*. The color of the leaves corresponds with that of the stem, and is equally subject to vary from a dark (for I have seldom seen it of a pale) green to a deep brown: when dry the leaves are rigid and brittle. The *reticulation* is small, formed by subquadrate cellules.

Perichatial leaves (f. 5. 5) numerous, surrounding the base of the calyx, and closely imbricated, subquadrate, approaching to round; the *exterior* ones for the most part divided by an obtuse sinus into two equal, acute, erect segments; the *interior* cut into three, four, or five unequal ones: they are all of a paler color than the rest of the leaves, but resemble them in the size and form of the cellules of which they are composed.

MALE FRUCTIFICATION, according to Dr. Smith, within the axillæ of the terminal tufts of leaves. *Anthers* small, spherical, yellow, situated upon short, pellucid footstalks.

FEMALE FRUCTIFICATION always terminal upon the stems and branches.

Calyx (f. 6) large in proportion to the size of the plant; about a quarter of a line long, oblong, plicate: the mouth, which is by no means contracted, is cut into small obtuse teeth. The whole is extremely delicate, appearing like a thin membrane, though under a high power of the microscope the reticulation formed by oblong cellules is very apparent. At the base the calyx has generally a faint tinge of green; the extremity is white, and diaphanous.

The *calyptra* is ovate, extremely delicate and pellucid.

Peduncle remarkably slender, a line or a line and a quarter long, white, cellulose, shining.

Capsule (f. 7) oblongo-ovate, deep red-brown, longitudinally and transversely furrowed.

Seeds and spiral filaments (f. 8) of a reddish-brown, the former perfectly spherical, the latter composed of a double *helix*.

Obs. The nearly capillary surculi, in consequence of the minuteness of the leaves, which are scarcely to be distinguished by the naked eye, are compared by Dr. Roth to *Byssus velutina*; whence his specific name.

That the present plant is the *J. byssacea* of Roth I believe there will be found no reason to doubt. Authentic specimens in Dr. Smith's herbarium exactly correspond, and the description in the *Flora Germanica* is excellent. This author justly observes that "*siccitate caules ob folia remota contracta quasi nodulosi, et primo intuitu Corallinæ officinalis ramulum repræsentant.*" I cannot, however, coincide with him in considering it a variety of, nor in supposing it has any kind of affinity with, Hoffmann's *J. excisa*, which, to judge both from the description and remark at the end of it, is the same species as Mr. Dickson's plant, of the same name. Dr. Roth farther

observes that Schmidel's figure of *J. bicuspidata*, *Diss. Jung. f.* 16. accurately expresses the habit and situation of the leaves of *J. byssacea*, and that he should certainly have quoted it as a synonym, were it not for the gemmiferous globule being there represented as situated upon the extremity of the naked stem, while in the present species it is immersed in tufts (*rosulæ*) of leaves. To me, however, it appears that Schmidel's figure just alluded to was intended for the true *bicuspidata*, and though I have quoted, doubtfully, fig. 2. t. 62. 20. of that author's *Icones* as the gemmiferous plant of *J. byssacea*, I have much more reason to think it was really intended for this species than the figure in his *Dissertatio* referred to above. "Mihi occurrerunt (he says) inter plantulas masculinas et femineas florentes hujus Jungermanniæ (*J. exsectæ*), minutissimæ plantulæ globuliferæ alius Jungermanniæ, cujus folia brevia, et obtusius bisecta fuerunt; adjeci igitur ea huic tabulæ, sed videntur pertinere ad Jungermanniam istam minimam quam t. 64. f. 2. pictam exhibeo." This reference to f. 2. t. 64. is a still farther inducement for me to consider the plant just mentioned as belonging to Roth's *byssacea*: for although Schmidel was of opinion that the one referred to was probably a variety of his *J. bicrenata*, (*J. inflata*. Huds.) and notwithstanding some of the lower leaves of the figure more nearly resemble those of *J. excisa*, yet the different shape of the calyx in the former of these Jungermanniæ, and the generally simple mode of growth of the latter, forbid their being united with it. It is surely not drawn with the accustomed accuracy and minuteness of the author of the *Icones Plantarum*, and leaves me so far uncertain as to its identity, that I have not ventured upon the name of *bifida*, which Schreber, the editor of the third fasciculus, has, in a note, proposed should be given to it*.

With regard to the situation of the *Gemmæ* upon *J. byssacea*, it might naturally be expected, from its close affinity with *J. bicuspidata*, that they would be found produced in similar spherical clusters and in the same situation as in that species. Such, too, appears to be the case from Schmidel's figure, so that in all probability what Roth has found in the clusters of terminal leaves and looked upon as analogous to the gemmæ in *J. bicuspidata*, are real anthers, such as are noticed by Dr. Smith in *English Botany*.

Allied as this species certainly is to *J. bicuspidata*, and slightly as it may appear to be distinguished from it in the specific character, yet it will be found to differ remarkably in its minute size, in the remote situation of the leaves, in the shortness of these in proportion to the diameter of the surculus, in the deeper and browner color of the whole plant, and more particularly in the calyces being always terminal upon the surculi, and in their being surrounded at the base by perichæatial leaves, which are less deeply divided, and which have segments never, that I have been able to discover, in the least recurved.

In their places of growth a difference may be remarked; for, while *J. bicuspidata* affects moist and shady banks or the boggy parts of heaths, *J. byssacea* is most commonly met with on open and exposed situations, in dry foot-paths, and even forming, upon sand-hills, blackish patches, visible at some distance from the dark green of the surculi and foliage.

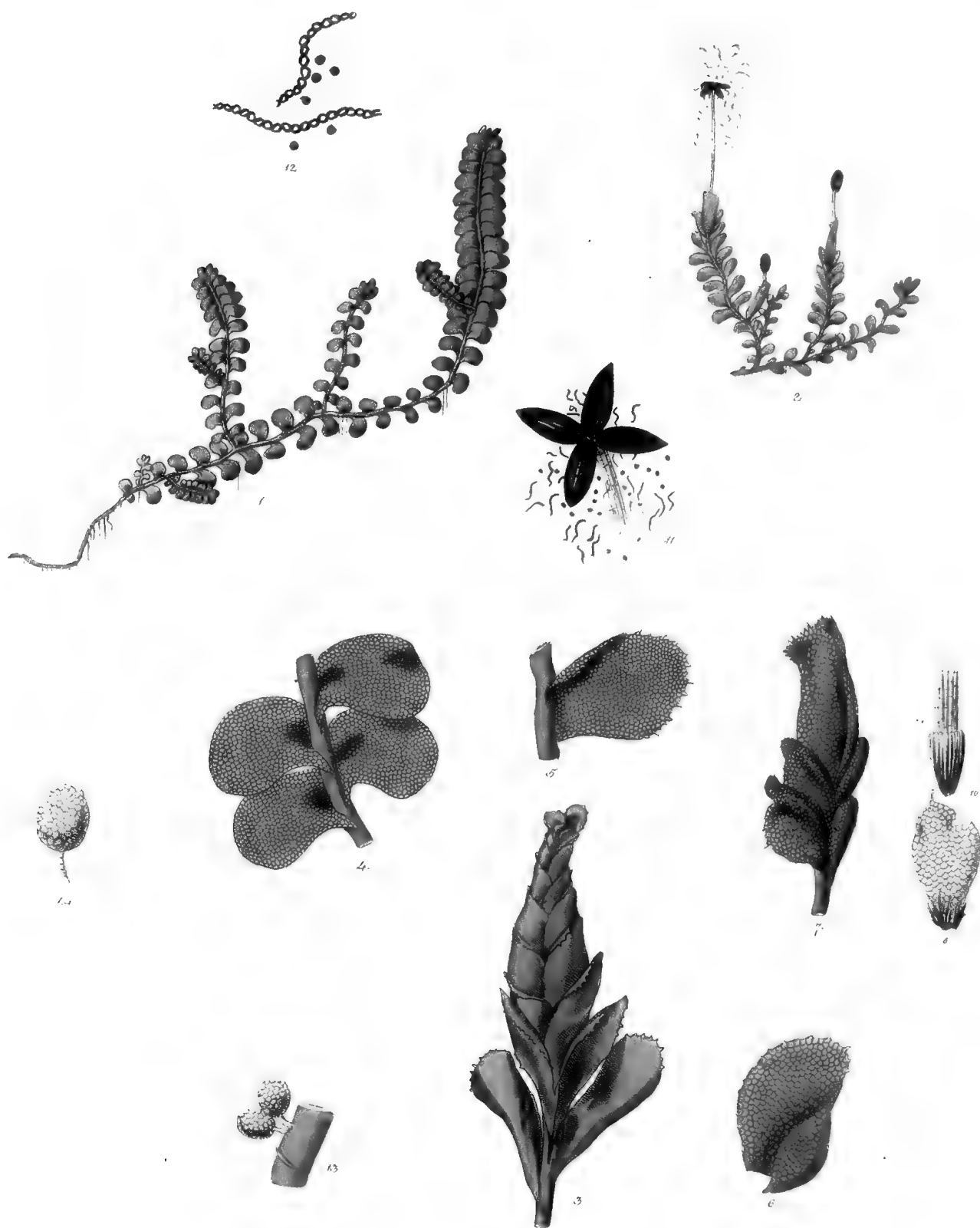
* Since the above has been printed I have been favored by Mr. Lyell with a new British species of Jungermannia, which agrees in more particulars with the plant figured in Schmidel, t. 62. 20. f. 2. and t. 64. f. 2. than *J. byssacea*, and which I have very great reason to suppose is the same.

REFERENCES TO THE PLATE.

FIG.

1. <i>A tuft of J. byssacea, natural size.</i>	
2. <i>A single plant, natural size.</i>	
3. <i>The same magnified</i>	6
4. <i>Portion of the surculus and leaves</i>	3
5, 5. <i>Perichæcial leaves</i>	2
6. <i>Calyx</i>	2
7. <i>Capsule, after the discharge of the seeds</i>	2
8. <i>Seeds and a spiral filament</i>	1





Jungermannia asplenoides
Jungermannia asplenoides L. var.

BRITISH JUNGERMANNIÆ.

(*J. asplenoides*.)

JUNGERMANNIA ASPLENIoidES.

(TAB. XIII.)

JUNGERMANNIA, surculo ascendente, ramoso: foliis obovato-rotundatis, ciliato-dentatis, subrecurvis: fructu terminali, lateraliq; calycibus oblongis, compressis, obliquis; ore truncato, subciliato.

- Jungermannia asplenoides*. LINN. *Sp. Pl.* II. p. 1597. *Syst. Nat.* II. p. 705. POLLICH, *Pal.* III. p. 174. SCOPOLI, *Carn. ed. 2da.* II. p. 344. LEERS, *Herb.* p. 249. SCHRANK, *Baiersche Flora.* II. p. 494. WEIS, *Plant. Crypt.* p. 110. WEBER, *Spic. Fl. Goet.* p. 132. WILLD. *Ber.* p. 340. OEDER, *Enum. Pl. Fl. Dan.* p. 41. HEDWIG, *Theoria.* t. 16. et 17. ALLIONI, *Fl. Ped.* III. p. 311. VILLARS, *Delph.* III. p. 922. ROTH, *Germ.* III. p. 368. HOFFMANN, *Germ.* II. p. 87. RELH. *Cant.* p. 437. *Fl. Dan.* t. 1061. LIGHTF. *Scot.* II. p. 771. WITH. III. p. 852. LINN. *Syst. Nat. ed. Gmel.* II. p. 1347. LAMARCK, *Encycl. Bot.* III. p. 278. LAMARCK, *Fl. Fr.* II. p. 431. LAMARCK, *Fl. Gall.* p. 92. *Engl. Bot.* t. 1061.
- Lichenastrum Trichomanis* facie, capitulis e foliorum summitate enascentibus, majus. RAI *Syn.* p. 112. n. 16.
- Jungermannia major*, foliis subrotundis, tenuissimè denticulatis. MICHELI, *Nov. Gen.* p. 7. t. 5. f. 1. 2.
- Hepatica asplenoides*, ramosa, major, florida, muscus *Nummulariæ folio*, major. VAILLANT, *Par.* p. 99. n. 10.
- Lichenastrum Asplenii* facie, pinnis laxioribus. DILL. *Musc.* p. 482. t. 69. f. 5. A. B. C. (excl. syn. Mich. t. 5. f. 3.)
- Lichenastrum Asplenii* facie, pinnis confertioribus. DILL. *Musc.* p. 483. t. 69. f. 6. A. B. C. (excl. syn. Vaill. *Par.* t. 19. f. 7.)
- Jungermannia foliis pinnatis*, subrotundis, sparsis, ex apice florifera. HALL. *Helv.* III. p. 60. 1869.

HAB. Frequent in moist woods and shady hedge-banks, producing fructification in the south of England very rarely; in the subalpine countries of the north more frequently; and also in Ireland, according to *Dr. Stokes*.

PLANT sometimes growing in dense and nearly erect tufts, but more generally in loose and straggling patches among *Hypna* and other mosses.

(*J. asplenoides*.)

BRITISH JUNGERMANNIÆ.

Surculi either erect or procumbent, throwing out a few fibrous radicles from their base, and here and there from the whole extent of their lower surface, about the thickness of common packthread, from two to four or five inches in length, flexuose, now and then beset with simple ramuli, or furnished with young shoots, which, in their more advanced period of growth, resemble divisions of the surculus. The color varies from a dull green to a reddish brown. In substance the surculi are firm, but flexible, the cellules very compact.

Leaves from one to two lines in length, alternately placed in two rows on each side of the surculus, often closely arranged towards its extremity; the rest more or less remote: all of them are horizontal, having the ends slightly recurved, so as to present a convex upper surface; their base is semiamplexicaul, the lower margin very decurrent: in shape the leaves are obovate approaching to round, their margins either entire (f. 4), slightly dentate (f. 3), or, as is most frequently the case, dentato-ciliate (f. 5), and this in so striking a manner as to be often visible to the naked eye. The color is a dull yellowish green. The reticulation small in proportion to the size of the leaf, formed of roundish cellules.

Perigonal leaves ten or twelve in number (f. f. 3. and 6), closely imbricated on each side of the surculus and entirely surrounding it, roundish, concave, ventricose at the base; the margins more or less dentato-ciliate, some of them a little recurved.

Perichatral leaves exactly resembling the cauline ones, only that they have their lateral margins more recurved and often revolute: they are, too, erect.

MALE FRUCTIFICATION in the axillæ of the perigonal leaves, and sometimes situated, also, in various parts of the surculus, but most frequently occupying the extremity. The *Anthers* (f. f. 13. 14) are in clusters of from two to four or five: they are ovate, when perfect of a greyish color. I have seen the apex open, whence the pollen has been discharged, leaving the cuticle white, pellucid and reticulated. The filament is about half the length of the anther, white, transparent, transversely striated.

FEMALE FRUCTIFICATION terminal upon the surculi and shoots. Occasionally, too, lateral, or, perhaps, only appearing so in consequence of the production of a shoot immediately beneath it (f. 2).

Calyx (f. 7) from two to three lines in length, generally leaning on one side, so as to be somewhat scymitar-shaped. The base is almost cylindrical, the mouth truncate, very much compressed (except when forced apart by the capsule and peduncle): the opening extends a little way down on one side of the calyx, where, as well as on the whole of the upper margin, it is dentato-ciliate. In color and texture the calyx exactly resembles the leaves.

Calyptra (f. 8) obovate, or rather pyriform, tipped with a short style, of a delicate texture, strongly reticulated at the base: it is surrounded by numerous *barren pistilla*, each of which is lineari-lanceolate, longitudinally and transversely striated; the mouth is open and a little expanded.

Peduncle from an inch and a half to two inches long, white, shining, loosely cellulose. It is inserted into the receptacle by means of a fibrous bulb (f. 10), of an obconical shape, which is with ease drawn out along with the peduncle. A similar cluster

of fibres I have remarked upon the peduncles of two or three large exotic species of the genus.

Capsule ovate, dark purplish-brown, approaching to black, opening with four equal lanceolate valves, each of which is marked with longitudinal furrows (f. 11).

Seeds spherical, reddish-brown: *spiral filaments* of the same color, and formed of a double *helix* (f. 12).

Almost every author has followed Linnæus in making the "*Lichenastrum Asplenii facie, pinnis confertioribus*" (*Hist. Musc.* p. 483. 6), a variety of the present plant. Dillenius, who was induced to describe it as a distinct species only out of deference to preceding botanists, remarks "simillima est hæc præcedenti (*J. asplen.*), nec ab eâ distinguitur, nisi quod folia densiùs nascentur et magis imbricatim invicem imponentur, nervum magis protegentia, pinnarum extremitatibus et margine interiore evidentiùs crenatis et quasi spinosis."—These little differences in the leaves are to be found not only upon plants growing in the same patch, but are even to be met with on the same individual, so that I have not thought it proper to retain these even as varieties. The Michelian synonym *Jungermannia major, foliis brevioribus et obtusioribus non dentatis*, and that of Vaillant, *Hepaticoides Polytrichi facie*, I have excluded from the references here made, because, both from the descriptions and figures of their respective authors, I am led to consider the plant they allude to as *J. polyanthos*, rather than *J. asplenioides*.

This species, though sufficiently well marked to render it needless for me here to point out its distinguishing characters, is, nevertheless, in general habit, in the strong denticulation of the leaves, and more particularly in the circumstance of the opening of the calyx not being confined to its extremity, but continued a little way down on one side, nearly allied to *J. spinulosa*; and it is not improbable but they may hereafter constitute a distinct genus, apart from every British species at least, founded upon characters taken from the form of the calyx. To these, in some respects, Swartz's West Indian *Jungermanniæ adiantoides* and *patula*, bear a considerable affinity; but in both of them the calyx is described as formed "*e foliolis conniventibus*," as is the case in *J. juniperina* of Swartz and of this work, in *J. emarginata* of Ehrhart, and in *J. scalaris*; but not in *J. asplenioides*.

The situation of the male flowers in the different species of the genus is well worthy of attention. The present is one of the few species belonging to a division that I am acquainted with, with simple leaves, in which the perigonal leaves take a different form from the rest, and, by their bifarious and closely-imbricated disposition, are rendered conspicuous at first sight. These, however, according to the observations of Hedwig, fall off when they are no longer wanted to protect the anthers: "*calvus est in caule locus, ubi flos fuerat; nam tegmina antherarum subinde cadunt, vel consumuntur.*" The anthers of *J. asplenioides* have also been seen by M. L' Abbé Haüy, in France, as we learn from the *Encyclopédie Méthodique*. The words of this gentleman are "Cette plante porte sur la partie postérieure de l'extrémité des rameaux, qui ont pris un certain accroissement, de petits boutons ou des points noirs très-sensibles, portés par des espèces de pédicules fort courts et aplatis Ces points sont

ordinairement au nombre de quatre et disposés en croix." There can be no doubt that what the Abbé has here described are male fructifications, yet I have never myself observed the anthers (*petits boutons*) to be of a black color, nor that they are "*disposés en croix*." I have not yet been fortunate enough to discover the anthers of *J. spinulosa*, but, judging from the similarity that exists in the female fructification of the two plants, I am induced to suspect that they will be found to correspond in the male also.

The barren plants of some of the larger species of *Bryum*, as *B. punctatum*, and, more especially, the trailing surculi of *B. cuspidatum*, *B. ligulatum*, and *B. rostratum*, may occasionally be confounded with this *Jungermannia*; but, besides the different shape of the leaves, the nerve in those of the mosses will at once afford a distinguishing character. From *Hookeria lucens*, with the leaves of which it bears a still greater resemblance, it may always be known by the bifarious, and never trifarious insertion of its leaves, by their rounder figure, and by their strong denticulation. The *Hookeria*, too, has the cellules, of which the leaf is composed, much larger, and of a more ovate figure than *J. asplenioides*. Lamarck says of the plant before us, that it has something the habit of *Hypnum adiantoides* (*Fissidens Hedw.*), but is much larger, and has the leaves of a rounder figure; an observation that will scarcely be considered as made with his usual happiness of remark.

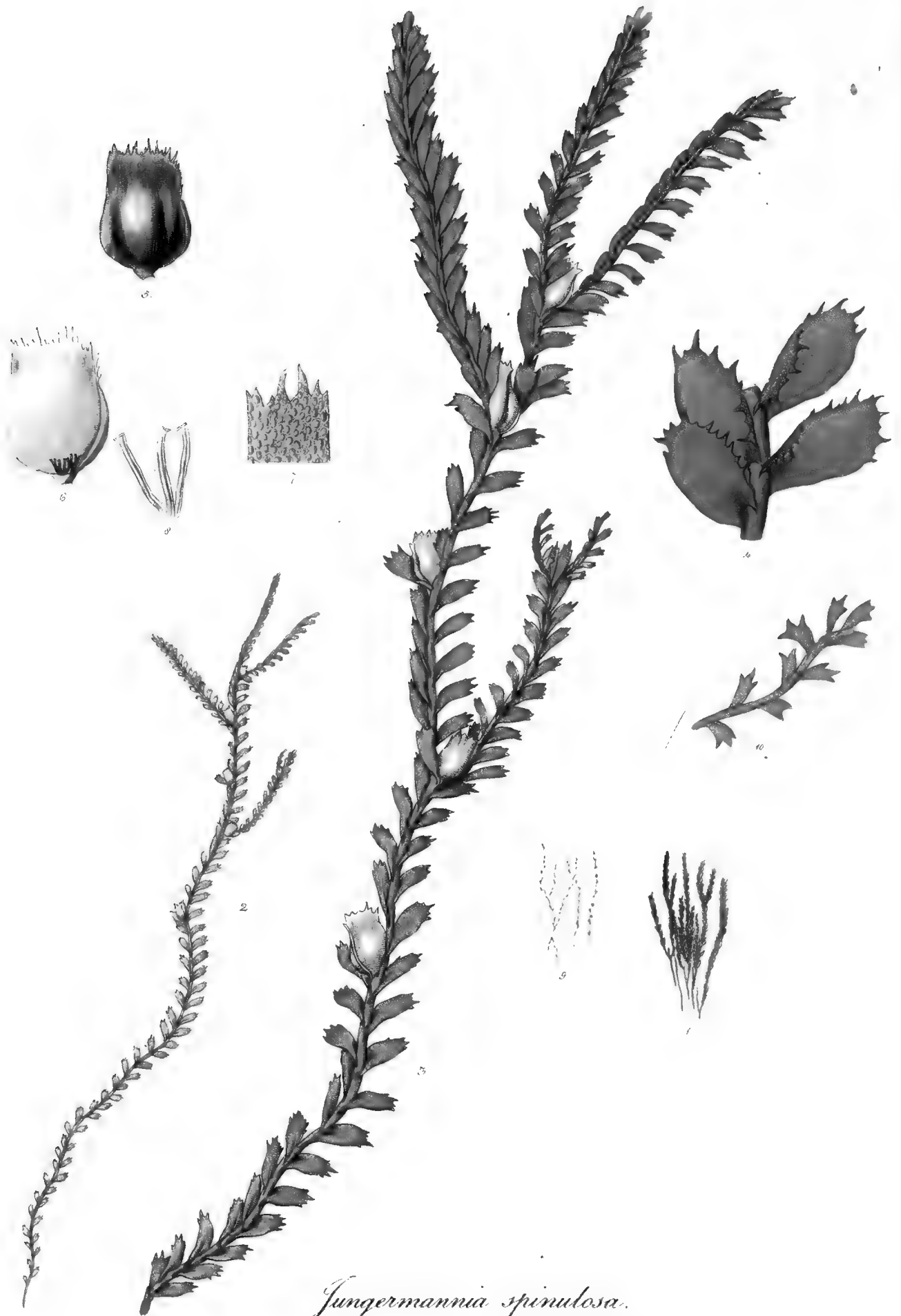
The female fructification, which in England is not of frequent occurrence, in France seems to be still more rare, and the authors of the *Flore Française* observe, that they have never themselves seen it.

Under this species, Weber, in his *Spicilegium Floræ Goettingensis*, observes "*Vagina exterior crenata. Interior ovoidea, in altero latere spinula infra apicem inserta donata.*" By "*spinula infra apicem*," he probably alludes to the style, which, however, I have always remarked to be exactly terminal.

REFERENCES TO THE PLATE.

FIG.

1. Barren plant of *J. asplenioides*, natural size.
2. Female plant, natural size.
3. Extremity of the surculus of a male plant, magnified 4
4. Portion of the surculus and leaves 4
5. Leaf, seen from behind 4
6. Perigonal leaf 3
7. Calyx and perichæatial leaves 4
8. Calyptra 3
9. Barren pistillum 2
10. Lower part of the peduncle, shewing the fibrous bulb at its base 2
11. Capsule burst, discharging its seeds and spiral filaments 2
12. Seeds and spiral filaments 1
13. Anthers (the perigonal leaf being removed to exhibit their insertion) .. 2
14. Single anther 1



Jungermannia spinulosa.

JUNGERMANNIA SPINULOSA.

(TAB. XIV.)

JUNGERMANNIA, surculo erecto, ramoso: foliis obovatis, recurvatis, hinc margine apiceque dentato-spinulosis: fructu laterali, axillarique; calycibus subrotundis, compressis; ore truncato ciliato.

Jungermannia spinulosa. DICKS. *Crypt. Fasc.* II. p. 14. WITH. III. p. 856. LINN. *Syst. Nat.* ed. Gmel. II. p. 1349.

Jungermannia serrata. ROTH, *Cat. Bot.* I. p. 144.

Lichenastrum pinnulis alternis, quasi spinosis. DILL. *Musc.* p. 489. t. 70. f. 16. (excl. syn. MICH.)

Lichenastrum ramosius, foliis trifidis. DILL. *Musc.* p. 489. t. 70. f. 15.

β. **TRIDENTICULATA**, foliis minoribus, paucioribus, apicibus trispinosis.

Jungermannia tridenticulata. MICHAUX, *Bor. Am.* II. p. 278.

HAB. Wales. *Dillenius*.—On the Scotch Alps. *Mr. Dickson*.—Not uncommon in the mountainous parts of England, Scotland, and Ireland.—β. Mountains near Bantry. *Miss Hutchins*.—Cunnamara. *Mr. Mackay*.—(The *Calyces* are, according to Miss Hutchins, to be found at all seasons of the year.)

This PLANT grows in densely-crowded tufts or patches, of several inches in diameter.

Surculi varying in length from two to five inches, erect, flexuose, rarely simple, for the most part beset with a few scattered, short branches, sub-patent, and again divided, both the main and secondary branches throwing out annual innovations. The *texture* of the surculi is firm and compact; when dry, rigid and brittle; the *color* in the younger plants, and in the shoots, a dull yellow-green; in the older ones it varies from a yellowish to a reddish-brown.

Leaves (f. 4) a line long, distantly placed in the lower parts of the surculi, at the extremity more generally crowded: in shape they are obovate, having, however, as in *J. asplenioides*, a very decurrent and semi-amplexicaul base; the extremity is more

(*J. spinulosa*.)

BRITISH JUNGERMANNIÆ.

or less bent back, especially in the young shoots, and, in a dry state, so much so that they often meet behind; the margins too are revolute: of these the lower or anterior one is entire; the apex and upper or posterior margin is cut into many spiniform teeth, which are of unequal sizes, but all very conspicuous to the naked eye. The color of the leaf is a pale yellow-green, inclining to brown, tinged with red at the point of insertion: after having been kept some time in the herbarium the whole plant becomes a pale brown. The texture of the leaves is very compact, brittle when dry: the reticulated appearance (f. 7) is here very obscure, the cellules being small, ovate, and distantly placed, requiring a very high power of the microscope to distinguish them accurately.

The *perichætal leaves* do not, in the least, differ from the rest.

MALE FRUCTIFICATION unknown.

FEMALE FRUCTIFICATION lateral upon the surculi, and frequently arising from the axillæ of the branches. I have never seen it absolutely terminal.

Calyx (f. f. 5. 6) a line or rather more in length, roundish at the base, and swelling out a little; at the upper end compressed: the *mouth* is truncate, and dentato-spinulose; the opening, as in the last species, extends a little way down on one side of the calyx.

Barren pistilla (f. 8) eight or ten in number, situated at the bottom of the calyx, linear, of a greyish color, with longitudinal reddish streaks: the mouth is a little expanded. I have not seen the fructification, at present, in a more advanced state.

Var. β. (f. f. 9. 10) which has a most elegant appearance, scarcely exceeds an inch in length. The leaves are throughout very remotely placed, and at the upper extremity are cut sometimes into two, but more generally into three, large and acute teeth.

It is a little remarkable that *J. spinulosa*, which is not only an inhabitant of the alpine regions of Great Britain but of North America, and, as it appears, also, of Surinam*, should be unnoticed by every author on the Continent of Europe. Widely, however, as the plant itself is diffused, no part of the fructification had been known in any country, till Miss Hutchins found specimens in Ireland producing calyces in profusion. The greater part of these were old, and entirely empty: others had barren pistilla, but none had the fructification farther advanced. Calyces in the same state I have also found in Scotland.

According to the Dillenian herbarium, the two plants above quoted from the *Historia Muscorum* belong undoubtedly to the same species, not affording even sufficient marks to be considered as varieties of each other. The "*Lichenastrum ramosius, foliis trifidis*" might, indeed, from the description of Dillenius, be supposed to be the same as my *Var. β.*; but,

* Dr. Roth found his specimens upon some pieces of the bark of *Quassia amara*.

BRITISH JUNGERMANNIÆ.

(*J. spinulosa*.)

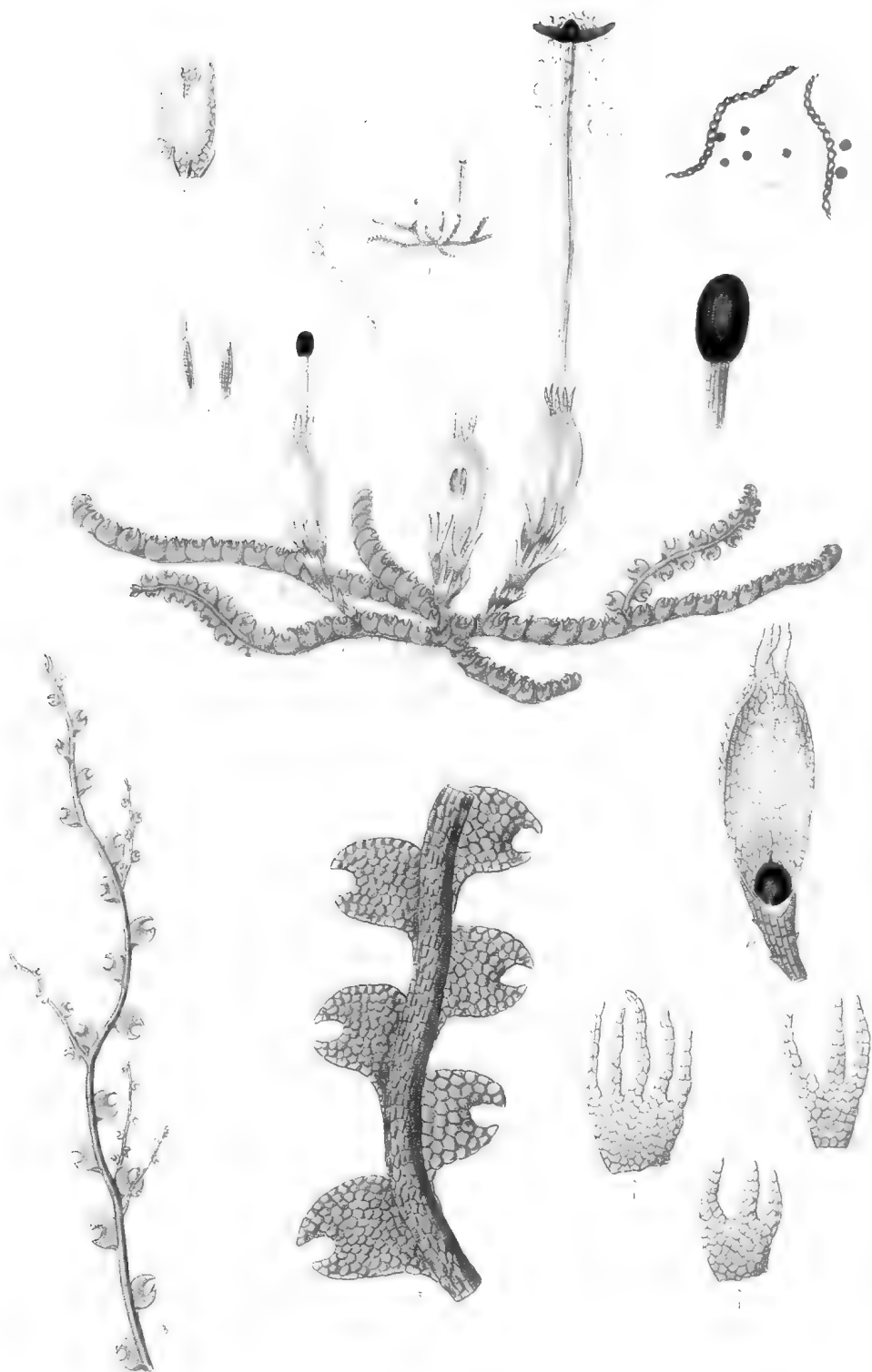
although the original specimen at Oxford is much smaller than the representation on the plate, and in that respect approaches more nearly to my variety, yet the leaves are by no means generally tri-spinose: on the contrary, by far the greater number are much dentated, and the only difference appears to be, that they have their teeth rather smaller and more numerous than is the case with the common state of the plant.

The present species may be considered as one of the largest and handsomest that the genus can boast, whether Europæan or exotic. Its affinity with *J. asplenoides* has been already noticed.

REFERENCES TO THE PLATE.

FIG.

1. *Small specimens of J. spinulosa, natural size.*
2. *A larger appearance of the plant with calyces, natural size.*
3. *Extremity of the same, magnified* 6
4. *Portion of the stem and leaves* 4
5. *Calyx* 4
6. *Horizontal section, exhibiting the interior of the calyx* 3
7. *Portion of the calyx, shewing its texture, which is exactly the same in the leaves* 1
8. *Barren pistilla* 1
9. *Var. β, natural size.*
10. *Portion of the same, magnified* 4



Jungermannia connivens.

BRITISH JUNGERMANNIÆ.

(*J. connivens*.)

JUNGERMANNIA CONNIVENS.

(TAB. XV.)

JUNGERMANNIA, surculo procumbente, stellatim ramoso; foliis orbicularibus, concavis, apice lunulari-emarginatis: fructu in ramis propriis, brevissimis, centralibus terminali; calycibus oblongo-ovatis; ore ciliato.

Jungermannia connivens. DICKS. *Crypt. Fasc. IV. p. 19. t. 11. f. 15.*

HAB. In umbrosis humidis. *Mr. Dickson*, l. c.—In boggy places in the neighborhood of Holt and Edgefield, Norfolk. *Rev. R. B. Francis*.—At Westleton, Suffolk, among *Sphagna* and other mosses.—I have also received specimens gathered by *Mr. Templeton*, near Belfast, and by *Mr. Mackay*, from a marsh in Cunnamara.—New Forest, Hants. *Mr. Lyell*.

OBS. The fructification is produced in April, and very profusely in May, according to the observations of *Mr. Lyell*.

This PLANT grows in small and loosely-entangled patches, of a pale yellowish green hue, throwing out here and there, from the whole length of its under surface,

Roots, which consist of minute, whitish, simple, and pellucid fibres.

Surculi filiform, flexuose, procumbent, varying from half an inch to an inch, or even to an inch and half in length; in certain situations, about the twentieth part of a line in diameter, semi-pellucid, cellulose, of a texture equally delicate with that of the leaves: the primary ramification, as in the congeners of this species (*J. bicuspidata*, *curvifolia*, and *byssacea*), is disposed in a somewhat stellated form, the branches being often again simply divided by subpatent ramuli, or, as may be seen in f. 3, producing small innovations.

The *Leaves* (f. 5), which have a bifarious insertion, are patent or erect, and more or less distantly placed, extremely minute, measuring from the fifteenth to the tenth of a line in length, orbicular, but decurrent at the base, above concave, convex below, cleft at the extremity by an orbicular notch in a very unusual manner, so that the segments are connivent; whence the name. The substance of the leaf appears peculiarly succulent and subcarnose, the *cellules* large, irregularly subquadrate, their surfaces slightly prominent. The color is a very pale yellowish green.

(*J. connivens*.)

BRITISH JUNGERMANNIÆ.

The *perichætal leaves* (f. 7) vary in number from five to ten, and occupy the short ramuli that support the fruit to the exclusion of such leaves as are produced on the rest of the plant, from which they differ materially in shape; the *exterior* ones being bifid or trifid, with lineari-lanceolate and strait segments; the *intermediate ones* more oblong in their figure, with trifid extremities, as in the former; while the *interior* are oblong, divided into four or five linear, erect segments, forming what might be called a *palmate leaf*. The *cellules* of all resemble those of the cauline leaves; the *color* is somewhat paler.

MALE FRUCTIFICATION at present unknown.

FEMALE FRUCTIFICATION supported upon short branches, evidently destined to this sole purpose, which are situated at the base of the surculi, and are, consequently, central with regard to the whole plant.

Calyx (f. 6) large in proportion to the size of the plant. I have observed it to be nearly a line in length, oblongo-ovate, attenuated at the base, of a whitish color, semi-transparent, elegantly marked with oblong reticulations, formed by the areolæ, or cellules, which are more compact than is the case in the leaves: the mouth of the calyx is contracted, and fringed with five or six erect cilia.

Calyptra (f. 8) ovate, whitish, reticulated, tipped with a short style, and surrounded at the base by a few

Barren pistilla (f. 9) of a greyish color, obscurely marked with longitudinal and transverse lines, of which some of the former are of a red color.

Peduncle rather more than a quarter of an inch in length, white, succulent, vasculose.

Capsule (f. 10) ovate, of a deep brown color, evidently, under the higher powers of a microscope, longitudinally and transversely furrowed.

Seeds and *spiral filaments* (f. 11) a rich chocolate brown; the former spherical, the latter formed of a double *helix*.

J. connivens, though it does not appear to be a very local species, was entirely unnoticed, till Mr. Dickson described it in his valuable publication on British Cryptogamic Botany; nor do I find it has been mentioned by any subsequent author. From Sweden I have received specimens by the kind communications of Dr. Swartz, under the name *J. limosa* mss., with the remark "*rara species in argillâ extensa*." Its fructification appears to be extremely rare. I never saw it, except upon a specimen which I found in a boggy part of Holt Wood, in the beginning of April, and upon others which I have received from Mr. Lyell in the present month of May; indeed, at the moment the description is going to the press.

The deeply emarginate leaf, with its rounded sinus and acute connivent segments, not unaptly compared to the form of the new moon, will at all times readily distinguish this species from all the rest of the genus, even if the calyx should not be present, which is equally unlike that of any other *Jungermannia*, and is rendered singularly beautiful by the delicacy of its texture (a peculiarity it has in common with every other part of the plant), and by the ciliated orifice.

BRITISH JUNGERMANNIÆ.

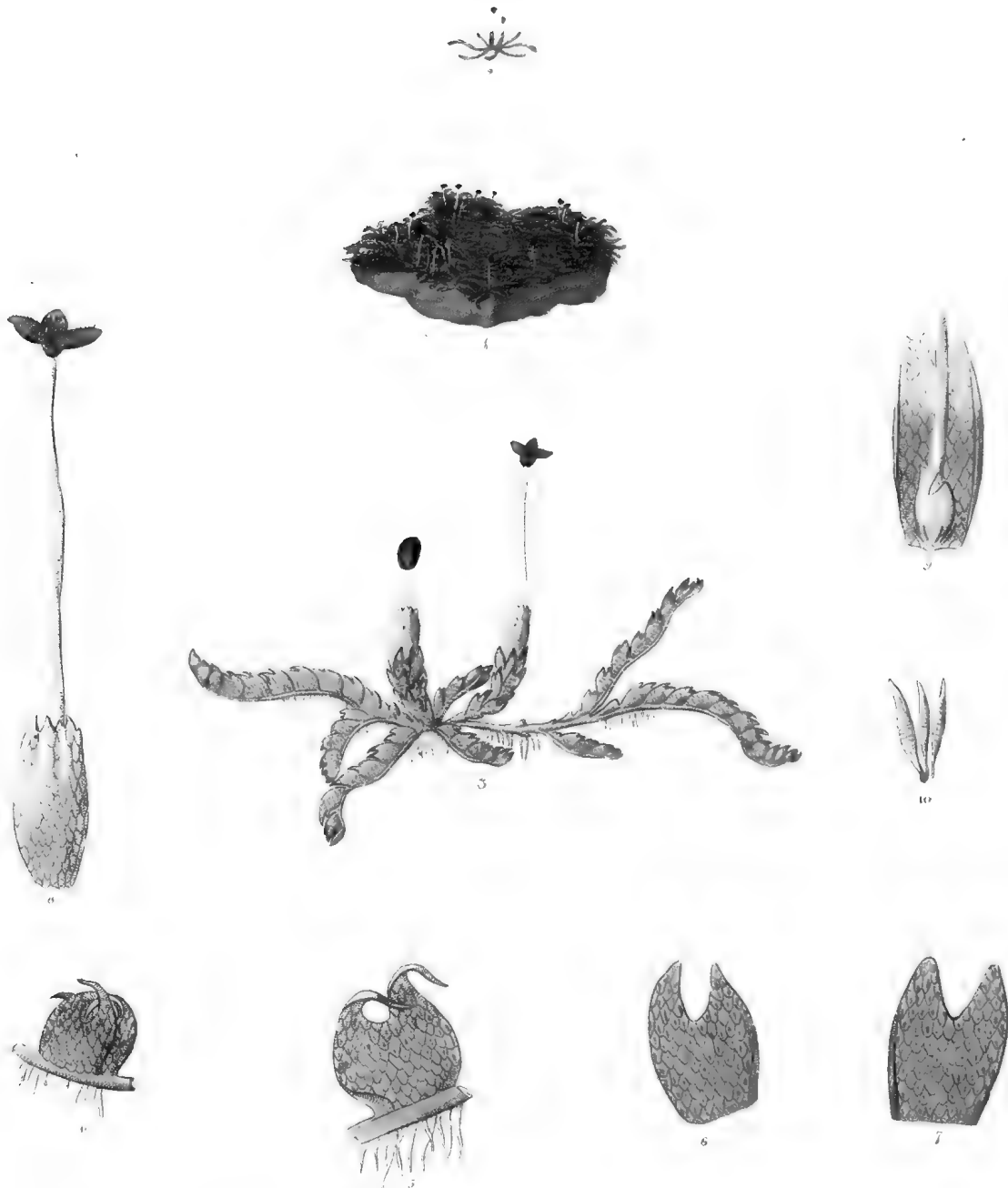
(*J. connivens*.)

I have had occasion, in another part of this work, to observe that a specimen of *J. connivens* exists in the Dillenian Herbarium, at Oxford, and is numbered so as to correspond with f. 4. A. B. t. 69. of the *Historia Muscorum*, which, however, more nearly resembles *J. bicuspidata*, though I have in compliance with preceding botanists quoted it, with a mark of doubt, under the description of *J. setacea* (t. VIII. of this work).

REFERENCES TO THE PLATE.

FIG.

1. Fertile plant of <i>J. connivens</i> , natural size.	
2. Barren specimen, with leaves more distantly placed than usual.	
3. Portion of the same, magnified	6
4. Female plant	6
5. Smaller portion of a surculus, with leaves	4
6. Calyx, cut open	4
7. Perichætial leaves	3
8. Calyptra	3
9. Barren pistilla	2
10. Capsule	3
11. Seeds and spiral filaments	1



Jungermannia curvifolia Hedw.

Jungermannia curvifolia.

JUNGERMANNIA CURVIFOLIA.

(TAB. XVI.)

JUNGERMANNIA, surculo procumbente, stellatim ramoso: foliis subrotundis, valdè concavis, bifidis; segmentis acuminatis, incurvatis: fructu in ramis propriis brevissimis centralibus terminali; calycibus oblongis, subplicatis; ore dentato.

Jungermannia curvifolia. DICKS. *Crypt. Fasc.* II. p. 15. t. 5. f. 7. WITH. III. p. 864. LINN. *Syst. Nat. ed. Gmel.* II. p. 1352. *Engl. Bot. t.* 1304.

HAB. In alpinis scoticis. *Mr. Dickson*, l. c.—Many places in the ascent to Crib-y-Ddescil, from Llanberris; and on the summit of Carnedd Llewelyn; also, near Llyn Llumbren, Denbighshire. *Mr. Griffith*, in *With.*—Usgoed-Eynon Garn, South Wales. *Mr. G. Sowerby*.—On decaying wood by a mountain-lake, near Bantry. *Miss Hutchins.*—On Ben Lawers, Ben Nevis, and boggy ground at a place called Balloch-nacreash, in the north-western part of Ross-shire.—Crannies of rocks, Mourne mountains, Ireland. *Mr. Templeton*.

PLANT forming small and loosely-entangled patches of a few inches in diameter, and of a deep purple color.

Root consisting of minute, whitish fibres, proceeding here and there from the under side, and most profusely from the lower part of the plant.

Surculi scarcely more than half or three-quarters of an inch in length, branching out from a centre in a sort of stellated manner, procumbent, filiform, flexuose; branches simple, or, as is more usually the case, once again divided; their diameter about the twelfth of a line; their *color* a pale yellow green, purple towards the extremity; their *substance* delicate, cellulose, flexible, but more rigid and brittle in a dry state.

The *leaves* (f. f. 4. 5) seem to be for the most part closely placed: they have a bifarious insertion, though, from their upright position, they have a second appearance; they are remarkably concave, and measure from the eighth to the fourth of a line in length; those at the extremities of the surculus being the smallest; their shape is round, approaching, however, to ovate; from the apex they are divided about half way down the middle by a rather obtuse sinus, of which the segments are acuminate, and incurved towards the hollow of the leaf, in a very striking manner. The *reticulation* is large, formed by oblong cellules. The *color* a pale green, changing, in those parts which are most exposed, to a fine purple.

(*J. curvifolia*.)

BRITISH JUNGERMANNIÆ.

The *perichæatial leaves* (f. f. 6. 7), six or seven in number, resemble the rest in every particular, excepting only that their segments are less acuminate and by no means incurved.

MALE FRUCTIFICATION hitherto undiscovered.

FEMALE FRUCTIFICATION arising from the base of the surculi.—Short ramuli support the *Calyces* (f. f. 8. 9) which are oblong or oblongo-ovate, in their color and cellules much resembling the leaves. Towards the apex they are a little plicate, and at the mouth, which is somewhat contracted, are seen a few short teeth.

Calyptra (f. 9) ovate, whitish, reticulated. *Style* short.

Barren pistilla (f. 10) surrounding the base of the calyptra: each is lineari-lanceolate, longitudinally and transversely striated.

Peduncle half an inch or more in length, of a silvery whiteness, often becoming spirally twisted.

Capsule ovate, deep brown, opening into four equal, ovate or oblongo-ovate valves.

The seeds and spiral filaments I have but lately had an opportunity of seeing in a perfect state: they exactly resemble those of *J. bicuspidata* and *connivens*.

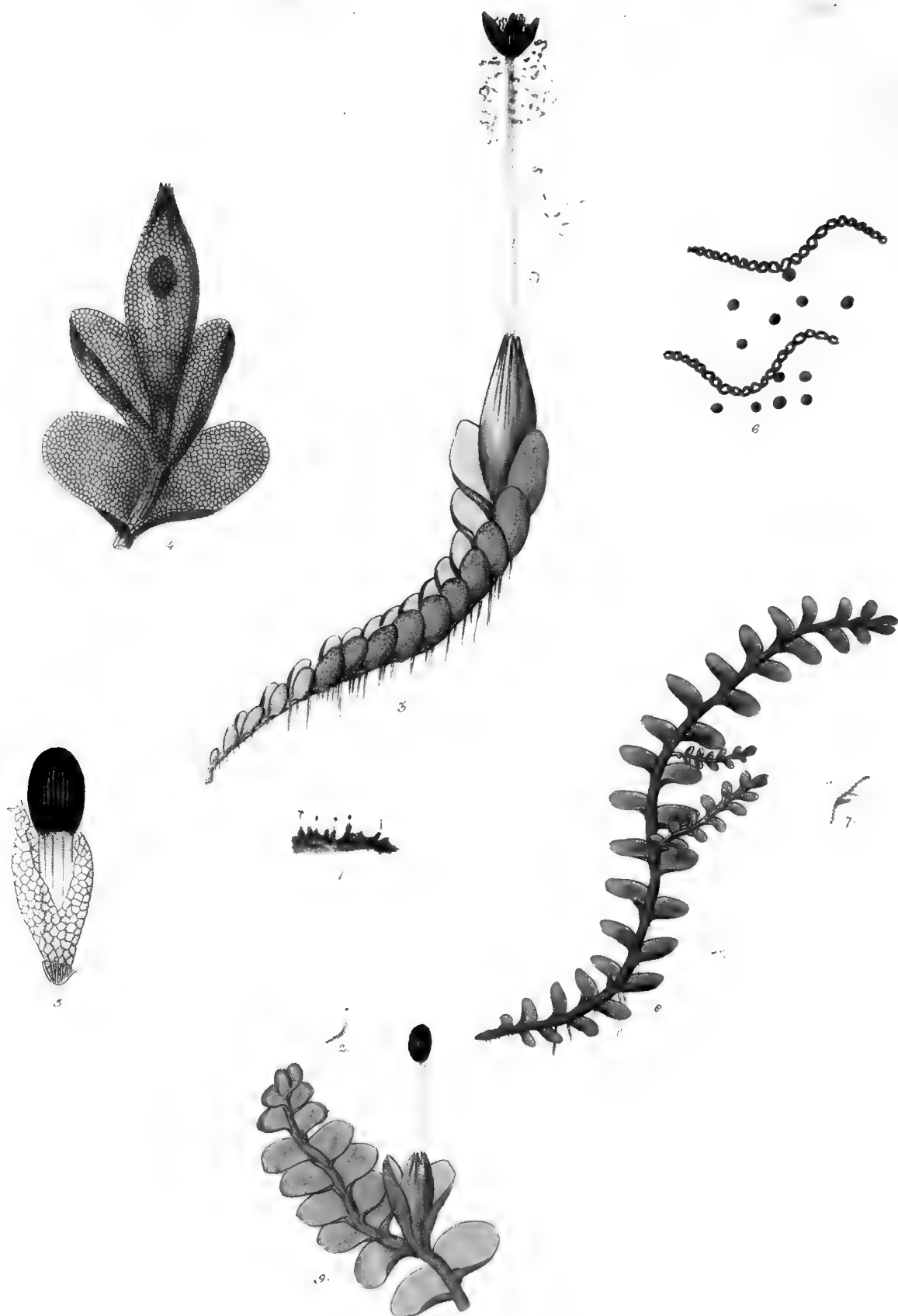
The natural affinity of this plant with the two species just mentioned is very striking, even to a superficial observer; more particularly to the former of them, from which, however, it essentially differs in the great length and in the incurved segments of the leaves, as well as in the erect (and by no means recurved) apices of the perichæatial leaves. The places of growth, too, of the three plants are widely different; the present species seeming to be altogether alpine, and partaking of the rich purple hue which is so common to other plants of the genus in similarly elevated regions.

We owe our first acquaintance with this *Jungermannia*, as well as with the one last described, (*J. connivens*) to the acuteness of Mr. Dickson. The figure given in *English Botany* does not exhibit the leaves so much incurved as is the case in my specimens; and, indeed, the whole plant, in that work, appears to bear a nearer approach to *J. bicuspidata* than I have ever observed it to do.

REFERENCES TO THE PLATE.

FIG.

- | | |
|---------------------------------------------------|---|
| 1. A tuft of <i>J. curvifolia</i> , natural size. | |
| 2. A single plant of the same. | |
| 3. The same magnified | 6 |
| 4. Portion of the stem and leaves | 4 |
| 5. Single leaf | 3 |
| 6. Exterior perichæatial leaf | 3 |
| 7. Interior perichæatial leaf | 3 |
| 8. Calyx, peduncle, and capsule | 4 |
| 9. Calyx opened, shewing the calyptra, &c. | 3 |
| 10. Barren pistilla | 2 |



Jungermannia pumila.

BRITISH JUNGERMANNIÆ.

(*J. pumila.*)

JUNGERMANNIA PUMILA.

(TAB. XVII.)

JUNGERMANNIA, caule ascendente, simpliciusculo: foliis elliptico-ovatis: fructu terminali; calycibus oblongo-ovatis, acuminatis; ore contracto, denticulato.

Jungermannia pumila. WITH. III. p. 866. t. 18. f. 4. *Engl. Bot.* 2230.

Lichenastrum Trichomanis facie minus, ab extremitate florens. DILL. *Musc.* t. 70. f. 10.

A. B. C. ? (*excl. syn.*)

β . NIGRICANS; caulibus ramosis, foliis remotioribus, nigricantibus.

HAB. Cwm Idwell. *Mr. Griffith*, in *With.*—On mountains near Bantry, Ireland. *Miss Hutchins.*—Near Belfast. *Mr. Templeton.*—Both *Dr. Stokes* and *Dr. Taylor* find it in the Dargle, near Dublin.—On rocks at Studley, Yorkshire.— β . On Craigalleach, in Breadalbane.

OBS. It produces capsules in May and June.

The PLANT grows in small and loosely-entangled patches, here and there sending forth, from the under side of the stem,

Roots, which are simple, pellucid, and of a whitish color.

Stems about half an inch in length and the tenth of a line in diameter, either wholly procumbent, or, as is generally the case, ascendant towards the extremity; for the most part simple, though occasionally divided, and in *Var. β* (f. 8) not unfrequently throwing out young shoots from their sides.

Leaves about the third of a line in length, rather closely placed, especially in α ; their position varying from horizontal to erect, not only in different individuals but often on the same plant; their figure ovate, approaching to elliptical, sometimes nearly round: in fertile specimens the uppermost are the largest (f. 3); in barren ones the contrary is the case (f. 8): all of them are somewhat concave, and at the base semi-amplexicaul; at the extremity I have, in two or three instances, remarked a slight and very obtuse notch, but whether it arose from accident or not I am unable to

(*J. pumila.*)

BRITISH JUNGERMANNIÆ.

say. The *texture* of the leaves is thin and delicate; the *reticulation* small, roundish; the *color* a pale yellowish green, changing in different situations to an olive green and even to a brownish black.

Perichatial leaves not differing from those of the other parts of the plant, except that the two uppermost pair are the largest of all, and are more uniformly erect in their position (f. f. 3. 4. 9).

MALE FRUCTIFICATION unknown.

FEMALE FRUCTIFICATION terminal, though it may now and then have the appearance of being lateral, in consequence of the elongation of a shoot immediately beneath it (see f. 9).

Calyx (f. 4) large in proportion to the size of the plant, somewhat exceeding three quarters of a line in length, and one quarter of a line in diameter in the widest part. It is lengthened out at the base, largest in the middle, and acuminate at the extremity, where it is slightly plicate. The *mouth* is small, contracted, and beset with minute teeth of unequal sizes: its *substance* and *color* exactly resemble those of the leaves.

Calyptra (f. 5) ovate, white, strongly and elegantly reticulated, at the apex tipped with a short tubular *style*; at the base surrounded by a few *barren pistilla*.

Peduncle from two to two and a half lines in length, white, glossy, transversely and longitudinally striated.

Capsule ovate, deep brown, dividing into four equal segments (f. 3).

Seeds brown, spherical, smooth. The *spiral filaments*, are of the same color, and composed of a double *helix* (f. 6).

My *Var. β.* might at first sight be taken for a distinct species. A patch of it has a very dark and almost blackish hue, though, viewed singly, an individual plant, especially when held against the light, appears of an olive-green color. The leaves are more distantly placed than those of *α*: they are, too, smaller, more inclining to oblong, and universally horizontal. The stems are slender and more branched, and, as observed above, frequently throw out young lateral shoots.

This *Jungermannia* was first discovered in Wales by Mr. Griffith, and by him sent as a new species to Dr. Withering, in whose work an imperfect figure and description are given. Without at all meaning to contradict these gentlemen as to the plant being really a nondescript, I find it so well accord with the Dillenian plant, figured t. 70. f. 10. A. B. C., that I have thought it right to refer to that author, though not without a mark of doubt. Linnæus refers to this synonym under his *J. lanceolata*, from which the authentic specimens in the herbarium at Oxford prove it to be quite different. These in the calyx, which is most remarkable, exactly correspond with the present plant, and the leaves, too, seem to bear an equal resemblance, as far as can be judged from the very injured state in which they now are. The figures, however, of Micheli, quoted by Dillenius, certainly belong to *J. lanceolata*.

Jungermannia pumila is distinguishable from barren specimens of *J. scalaris* and *J. crenulata* by its more ovate leaves and much smaller size; from *J. lanceolata* by its leaves being concave, whereas in the species last mentioned their surface is always plane. The singular form of the calyx will serve to keep it distinct from every other species.

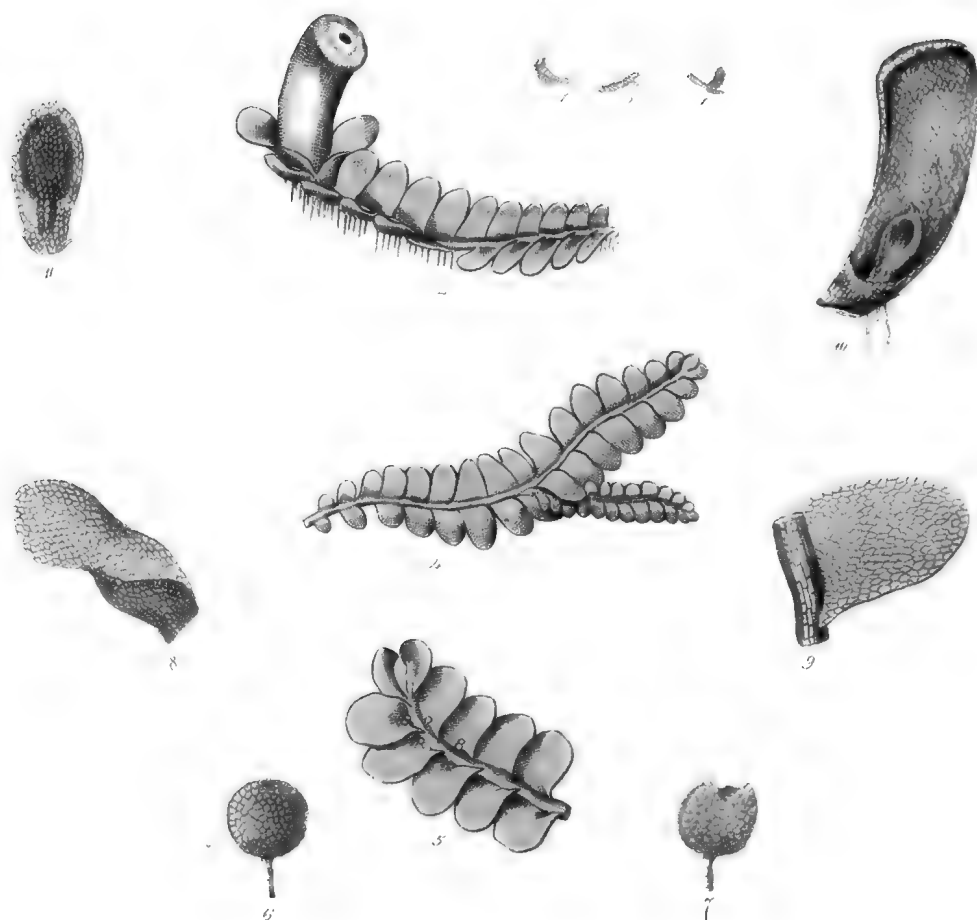
Although an alpine plant, *J. pumila* seems not at all particular in its choice of soil. Some of my Irish specimens are attached to a stiff clay: in Yorkshire I have found it growing upon hard lime-stone rock; and in Scotland I have gathered it from the micaceous schistus of the Breadalbane mountains.



REFERENCES TO THE PLATE.

FIG.

- | | | |
|----|--------------------------------------------------------------------------------------|---|
| 1. | <i>A small patch of J. pumila, natural size.</i> | |
| 2. | <i>A single plant of the same, natural size.</i> | |
| 3. | <i>The same, magnified</i> | 4 |
| 4. | <i>Extremity of a fertile shoot</i> | 3 |
| 5. | <i>Calyptra and young capsule</i> | 2 |
| 6. | <i>Seeds and spiral filaments</i> | 1 |
| 7. | <i>Var. β, natural size.</i> | |
| 8. | <i>The same, magnified</i> | 4 |
| 9. | <i>Extremity of a fertile plant of α, with the shoot projecting beyond the calyx</i> | 4 |



Jungermannia lanceolata
lanceolata (Schrad.) Dum.

JUNGERMANNIA LANCEOLATA.

(TAB. XVIII.)

JUNGERMANNIA, caule procumbente, subsimplice: foliis patentibus, ovato-subrotundis: fructu terminali; calycibus oblongis, cylindraceis, subarcuatis, apice depresso, plano; ore contracto, inciso-dentato.

Jungermannia lanceolata. LINN. *Sp. Pl.* II. p. 1597. *Syst. Nat.* II. p. 705. POLLICH, *Pal.* III. p. 179. LEERS, *Herb.* p. 249. SCHRANK, *Baiersche Flora.* II. p. 495. WEIS, *Plant. Crypt.* p. 114. WILLD. *Ber.* p. 340. ÆDER, *Enum. Pl. Fl. Dan.* p. 41. ALLIONI, *Ped.* II. p. 312. SCHREBER, *Spic. Fl. Lips.* p. 103. SCHRADER, *Samml. Lief.* II. p. 4. HOFFMANN, *Germ.* II. p. 88. ROTH, *Germ.* III. p. 373. LINN. *Syst. Nat. ed. Gmel.* II. p. 1348. LAMARCK, *Encycl. Bot.* III. p. 279. WITH. III. p. 853. HUDS. *Angl.* p. 510. LIGHTF. *Scot.* II. p. 773. *Lichenastrum, capitulis nudis, Trichomanis facie, foliolis densius congestis, minus.* RAII *Syn.* p. 112.

Jungermannia palustris, minima, repens; foliis subrotundis, densissimis, lætè virentibus. MICHELI, *Nov. Gen.* p. 8. t. 5. f. 6. et 7.

HAB. Woods and moist shady places in Westmoreland. *Hudson.*—Moist shady banks. *Withering.*—Moist shady places, and on rotten trunks of trees. *Lightfoot.*

PLANT growing in small dense clusters of a pale green color.

Root, a few minute, whitish, simple fibres, proceeding here and there from the under side of the plant.

Stems about a quarter or half an inch long, cylindrical, procumbent, simple, or now and then furnished with one or two short lateral shoots.

Leaves (f. f. 2. 4. 5) rather closely placed, always patent or horizontal, quite entire, ovate, having however a broad and semi-amplexicaul base: those at the base and the extremity of the barren shoots are the smallest (f. 4), the rest are about a quarter of a line in length: their color is a light, yellowish green, varying in the lower leaves to a dirty brown: the *reticulation* is large, composed of oblong cellules.

Perichæatial leaves (f. 8) larger and more oblong than the rest, at the base concave, and embracing the lower part of the calyx, their upper part patent.

(*J. lanceolata*.)

BRITISH JUNGERMANNIÆ.

MALE FRUCTIFICATION (f. 5) composed of *anthers* (f. 6), situated in clusters of two or three at the base of the cauline leaves, and most commonly of those that approach the extremity of the plant. They are quite exposed, as is the case with those of *J. pusilla*. Each is exactly spherical, minute, consisting of an exterior reticulated cuticle, and the olivaceous pollen, which is at length discharged from a ragged aperture at the extremity (f. 7). The *footstalk*, which is about the length of the anther, is white, pellucid, and transversely striated.

FEMALE FRUCTIFICATION terminal.

Calyx (f. f. 2. 10) very large, compared with the size of the plant, full a line in length and one-third of a line in diameter, a little incurved, cylindrical throughout, or slightly incrassated upward: the apex itself is depressed and flattened, so that the extremity is nearly a plane surface, as wide as any part of the calyx, and in the centre of it is situated the minute, contracted, and slightly-toothed mouth. The whole is perfectly destitute of furrows. Its *color* and *texture* are not distinguishable from those of the leaves, except that the former occasionally varies to a rich brown, appearing almost as if it were burnt.

Germen (f. 8) ovate, of a yellowish-green *color*, terminated by a small hollow *style*. A few *barren pistilla* surround its base.

Obs. The more forward state of the fructification I have never had an opportunity of seeing.

As well the figures here given, as the description, have been made from German specimens sent to Mr. Turner by Dr. Schrader and Dr. Mohr; and I am induced to represent the species in this work, rather with a view of calling the attention of the botanists of my country to what I conceive to be the true *Jungermannia lanceolata* of Linnæus, than from a full conviction of its ever having been found in Britain. Micheli is the earliest author who has noticed the present plant, to which Dillenius' t. 70. f. 10. has been referred by Linnæus and almost every subsequent botanist; but I have, under the description of *J. pumila*, given my reasons for supposing that this synonym more probably belongs to that species. Haller, in his *Hist. Stirp. Helv.* t. III. p. 61. n. 1871, under *Jungermannia foliis pinnatis, ovatis, confertis, ex apice florifera*, quotes Linnæus as well as the two other authors just alluded to, but in his description he says, "*folia paullum auriculata et in apice congesta, paullumque incurva*", and in another place "*ad Jungermanniam n. 20. Dillenii (J. albicantem) proximè accedit, sed differt foliis rotundioribus*"; so that I am rather induced to think that this great botanist has confounded the present species with one that I propose calling *J. obtusifolia*, which certainly approaches in many particulars to *J. albicans*. Weis has the same remark as Haller, and it is unfortunate that neither of them take any notice of the form of the calyx. Schrader and Roth are more particular on this point, so that I can quote with confidence their descriptions, while that of almost every other author is at least doubtful. Those given by Hudson, Lightfoot, and Withering, are particularly unsatisfactory; and the *Jungermannia* figured

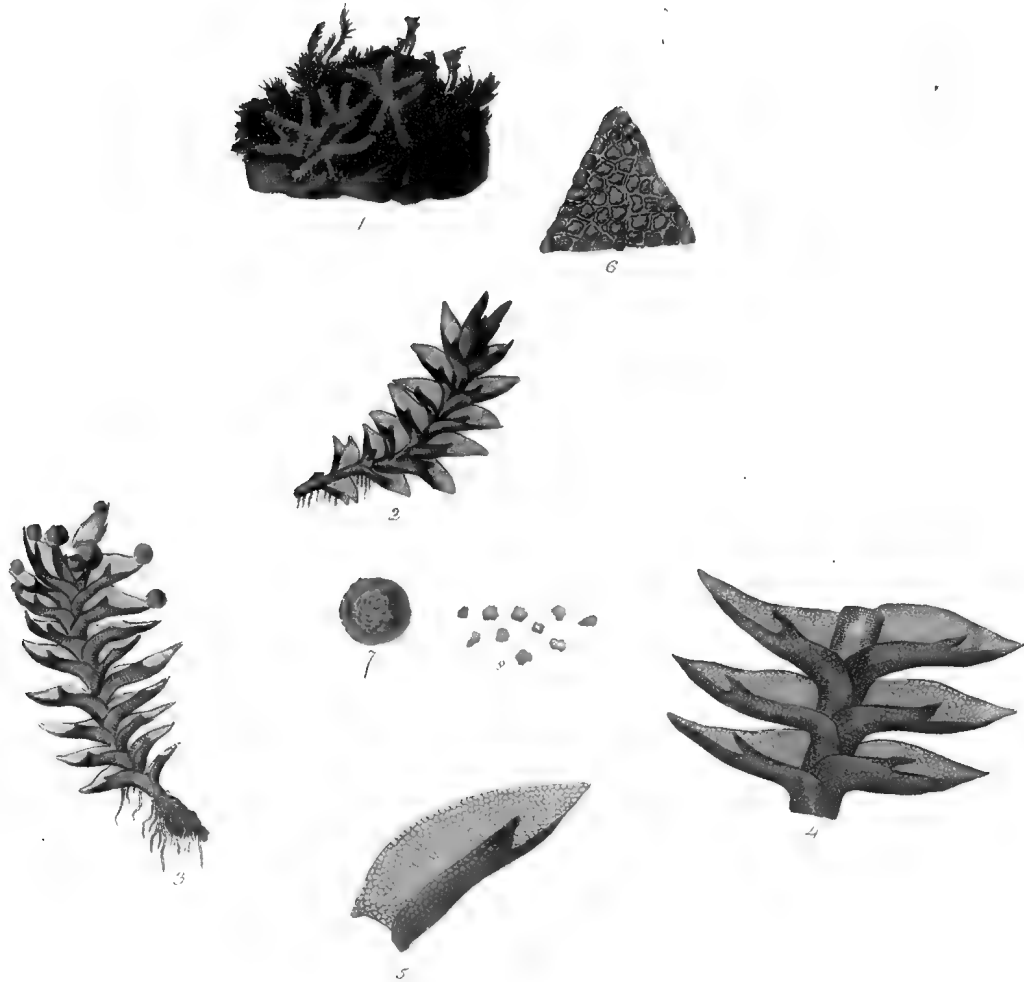
under the name of *lanceolata* in *English Botany* is *J. scalaris*, a plant which I have observed in collections not unfrequently mistaken for it; although the species before us abundantly differs, not only in the absence of stipules, but in the large and naked calyx.

In drying, as is well observed by Dr. Roth, the leaves become crisped; but they rapidly recover their original figure on being immersed in water.

REFERENCES TO THE PLATE.

FIG.

1. 1: Fertile plants of <i>J. lanceolata</i> , natural size.	
2. A fertile plant, magnified	5
3. A barren plant, natural size.	
4. The same, magnified	5
5. Extremity of a male plant	5
6. Anther in a perfect state	1
7. The same after the discharge of the pollen	1
8. Perichæatial leaf	4
9. Cauline leaf	3
10. Calyx dissected longitudinally	3
11. Germen	2



Jungermannia exsecta.
Sphenobolus exsectiformis (Brid.) Steph.

JUNGERMANNIA EXSECTA.

(TAB. XIX.)

JUNGERMANNIA, caule prostrato, simpliciusculo: foliis distichis, imbricatis, horizontalibus, concavis, ovatis, acutis; margine hinc unidentato.

Jungermannia exsecta. SCHMIDEL, *Icones*. p. 241. t. 62. f. 2. SCHRADER, *Syst. Samml. Lief.* II. p. 98?

Jungermannia globulifera. var. 1. ROTH, *Germ.* III. p. 381.

Jungermannia foliis bidentatis, in apice fragifera. HALL. *Helv.* t. IV. p. 59. (excl. syn.)

HAB. Moist and especially boggy heaths in various parts of Norfolk and Suffolk, as Holt and Edgefield Heaths (where it was for the first time discovered in England by Rev. R. B. Francis), and Mousehold Heath in the former county. In Suffolk Mr. Turner finds it near Yarmouth: it is also abundant on Westleton Heath, near Dunwich.—Near Bantry. Miss Hutchins.

PLANT firmly attached to the earth in small scattered patches, which are frequently disposed in a somewhat stellated form, and are rendered conspicuous by their yellow hue, or, in the globuliferous specimens, by the reddish color of the gemmæ.

Root consisting of thick tufts of minute, whitish, simple fibres, issuing copiously from every part of the under side of the shoots, which are often, as Mr. Francis remarks, affixed to each other by means of these radicles.

Stems prostrate, not much exceeding a quarter of an inch in length, fragile, greenish, densely cellular, simple, or sometimes, though rarely, producing a small shoot near the base.

Leaves (f. f. 4. 5) rather closely imbricated, distichous, patent or horizontal, about the third of a line long, gradually however becoming smaller towards the base of the plant, where they closely surround and firmly embrace the stem, so as entirely to conceal it:

(*J. exsecta.*)

BRITISH JUNGERMANNIÆ.

their figure is ovate, concave, or rather conduplicate, at the extremity very acute, and, what marks the species so decisively, furnished in the middle of the upper margin with a strong and sharp tooth, pointing a little upwards in a direction oblique with regard to the apex of the leaf. If Schrader be correct in his species, which I have great reason, however, to doubt, he finds the leaves to be generally unequally tridentate; while Schmidel, Mr. Francis, and myself, have observed them to be almost constantly bidentate, (provided the sharp apex may be allowed the appellation of a tooth,) though occasionally the lower ones, as may be seen in f. 2, of the plate, are tridentate. The *texture* of the leaves is particularly firm; the *cellules* very small and numerous, requiring a good magnifier to distinguish the reticulated appearance formed by their interstices; but with the highest power of the lens the cellules will be seen to be of a very irregular figure, and disposed throughout the substance of the leaf without any sort of order (f. 6). The *color* of the leaves is a pale green, very much approaching to yellow.

MALE FRUCTIFICATION unknown.

FEMALE FRUCTIFICATION (according to Schmidel, who alone has published an account of it, or even seen it) terminal, and produced (in Germany) in abundance in the months of May and June, if the weather should prove moist; never on those plants which bear the powdery globules, but upon such older individuals alone as are fast approaching to a state of decay. The *calyx* is described to be of an ovato-oblong figure, cut at the mouth into four obtuse teeth or lobes, and surrounded at the base by three or four pairs of unequally bifid and closely imbricated leaves; the *calyptra* ovate, tipped with a rather thick vesicular *stigma*; the *peduncle* white, pellucid, cellulose, about three times as long as the calyx; the *capsule* roundish, approaching to ovate, bursting into four ligulate valves, that are obtuse at their extremities; the *spiral filaments* very elastic, composed of a double *helix*, of a rufo-fusca color; the *seeds* extremely numerous, minute, and of a paler hue than the filaments.

The *Gemmæ* (f. 3) of this species are very abundant and peculiarly conspicuous, no less from their deep orange color, than from their situation. In the months of December and January they make their appearance, collected together in small spherical masses (f. f. 3. 7) about the tenth of a line in diameter, occupying the extreme points of eight or ten or more of the terminal leaves. The minute particles or gemmæ of which these balls are composed, are in their most perfect state closely united, but on putting them into water a very slight pressure is sufficient to cause them to separate, and a number of pellucid angular reddish bodies (f. 8) are observable floating in the liquid. In February, indeed, these particles disunite of themselves, and lie scattered over the leaves and stems of the plant in considerable quantity, having much the appearance of the farina of some phænogamous plants.

BRITISH JUNGERMANNIÆ.

(*J. exsecta*.)

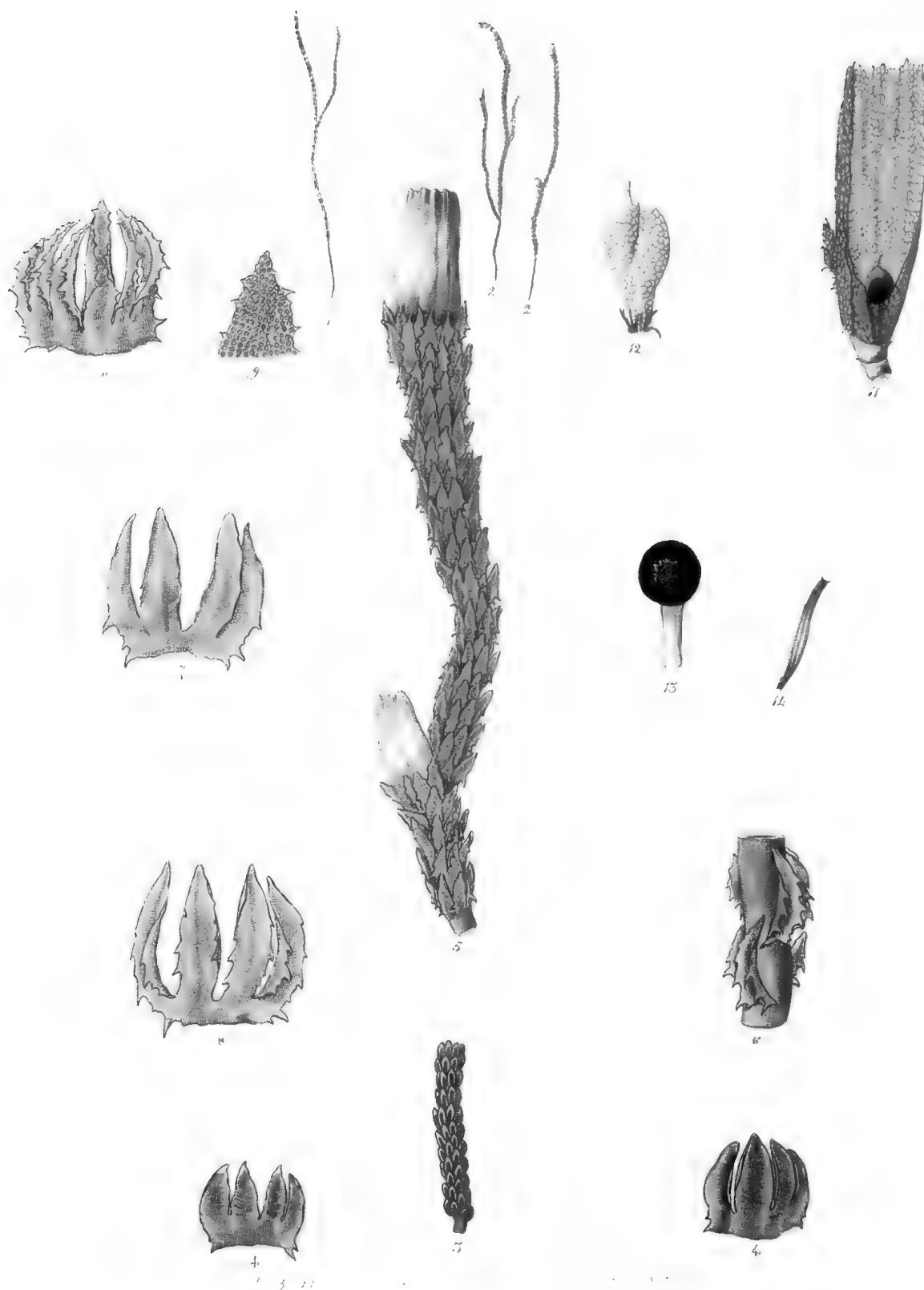
This singular species of *Jungermannia* seems to be confined to the two most eastern counties in the kingdom; at least I have never heard of its being found in any other places, excepting, indeed, very lately near Bantry, by Miss Hutchins, of whom it may almost with truth be said, that she finds every thing. It affects elevated and exposed situations, and is most frequently met with on those heathy soils which are not far removed from the sea. My friend, Mr. Francis, has long known it as an inhabitant of his neighborhood, and has preserved a drawing and description of it in his manuscripts, under the name of *J. acuta*. Schmidel discovered it about Bareuth and Erlangen, in 1758; but, though he has given an accurate figure and elaborate history of the barren state of the species, I cannot feel satisfied that his representation of the fertile plant belongs to the same; the drawing itself of that part being unsatisfactory. This suspicion, however, has not kept me from translating in my description what he says of the fruit. That he should have fallen into an error of this kind, supposing him really to have done so, is the less remarkable, when it is recollected that he finds the fructification not upon young, healthy, and vigorous plants, "sed in vetustis et penè emortuis," so that I am very much disposed to think that he may, like Dr. Roth, have confounded *J. exsecta* and *J. excisa* together. Of the Hallerian synonym, I am by no means certain: the description in some respects is at variance with our plant, yet I am still disposed to think that this is what the author really intended, from his speaking of the extremity of the leaves, as "ruberrimum quasi fragum ferens." The greater number of synonyms, too, that are cited by Schmidel, have been here omitted, because it appears to me that they ill accord with the characters of *Jungermannia exsecta*, which, if really permanent, as I have every reason to hope they are, are so striking, and so dissimilar to those of every other species of the genus, that I feel it would be quite needless to say any thing more respecting them.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. exsecta</i> , natural size.	
2. Barren plant, magnified	6
3. Globuliferous plant	6
4. Portion of the stem and leaves	4
5. Leaf	3
6. Apex of a leaf	1
7. Cluster of Gemmæ	3
8. Gemmæ	1





Jungermannia setiformis
Leucocnethus setiformis Ehrh.

JUNGERMANNIA SETIFORMIS.

(TAB. XX.)

JUNGERMANNIA, caule erecto, subsimplice: foliis bifariis, arctè imbricatis, erectis, quadratis quadrifidisque; angulis inferioribus margine hîc illic spinuloso-dentatis: fructu terminali lateralique; calycibus oblongis, plicatis; ore aperto.

Jungermannia setiformis. EHRH. *Beitr. Band.* III. p. 40. SCHRAD. *Syst. Samml. Lief.* II. p. 4. HOFFMANN, *Germ.* II. p. 82. ROTH, *Germ.* III. p. 364. LINN. *Syst. Nat. ed. Gmel.* II. p. 1352. LAMARCK, *Fl. Fr.* II. p. 437.

Jungermannia concatenata. LINN. *Lapp. ed. Smith.* p. 343.

β. ALPINA; foliis minoribus; segmentis integerrimis.

HAB. α has not hitherto been found in Britain.—β grows in great abundance upon the the summit of Cairn-gorum; and I have also received it from *Mr. Dickson* and *Mr. George Donn* of Forfar, both of whom gathered it upon the Scotch Alps.

PLANT growing in densely matted tufts, of some inches in diameter.

Root scarcely any, except that a few fibres may now and then be seen to proceed from the lower part of the plant.

Stems from two to three inches in length, filiform, slender, undulated, of a red or reddish-brown color, and firm texture, erect, simple, or once or twice irregularly dichotomous.

The *Leaves* (f. f. 4. 7. 8) are bifarious, erect, appressed, and so closely imbricated as to conceal the stem on every side. They are about a quarter of a line in length, of a quadrate figure, but rather broader than long, semiamplexicaul, divided from the extremity to within one-fifth of the base in α (in β to within one-third of that distance) into four equal, lanceolate, erect segments, which are keeled on their inner surface, and furrowed on the outer; their margins are recurved, those of α here and there beset with unequal, but strong teeth, generally pointing downwards, while in β, these margins are quite entire, though, in the lower angles of the leaves, in both the varieties, there are, immediately adjoining the base, two deflected teeth, the lowest of

(*J. setiformis*.)

BRITISH JUNGERMANNIÆ.

which is the largest. The *texture* of the leaves is rigid and brittle when dry; the *cellules*, which are of a roundish figure, are distantly placed, yet somewhat regularly, in longitudinal lines (f. 9). The *color* is a pale yellowish brown, inclining to olive in the Scotch variety.

Perichæatial leaves (f. 10) larger than the rest, and proceeding, as it appears to me, from all sides of the stem: the divisions of these leaves too are more numerous, frequently six or even seven, their margins more recurved, their teeth larger and more abundant. In other respects they exactly agree with the cauline ones.

MALE FRUCTIFICATION unknown.

FEMALE FRUCTIFICATION both terminal and lateral.

Calyx (f. f. 5. 11) nearly a line in length, oblong, plicate; the mouth toothed, but not at all contracted; the *texture* thin and rather delicate, much more so than that of the leaves; the *reticulation* small; the *areolæ* oblong; the *color* a pale yellow brown.

Calyptra obovate, reticulated, white; *style* rather short, slender, and tubular. The *barren pistilla* are numerous, situated at the base of the calyptra: each is linear, swelling out a little in the middle, its mouth slightly expanded.

The *Capsule* I have only seen within the calyptra, at which period of its growth it is exactly spherical, and of a deep olive-green color.

That the two plants here figured belong to one and the same species, I believe there will be found no reason to doubt. My variety β differs from α only in being smaller and of a more olive-green color, and in having the segments of the leaves entire. The drawing of α I have been under the necessity of making from foreign specimens: for this, I trust, no apology will be considered necessary, as I could not otherwise have represented the fructification, which is now described for the first time, though my description has been taken from the very specimens gathered in Lapland by Linnæus, who, in his own account of the plant, leaves the fructification unnoticed. The Lapland specimens, it may be remarked, as well as the German, and probably the French ones, too, are found in woods, whereas our British plant inhabits the highest of the Scotch Alps; and this difference in the place of growth may perhaps be considered as a cause in some measure of the different appearances they put on. From Dr. Swartz, also, I have been favored with fructified specimens, exactly agreeing with those here figured.

Ehrhart, who first discovered *J. setiformis* in the Hartz Forest, in Germany, justly remarks that the leaves are so deeply divided, that each individual may be taken for four separate leaves: but I cannot agree with that author in thinking that the segments are so strongly furrowed on the back as to represent in miniature a leaf of *Fontinalis antipyretica*. He farther adds, that he knows of no other plant which has such a peculiarity in the leaf.

There is in the general habit of this plant, particularly in the mode of growth, a considerable affinity with *J. julacea*. In both the leaves are rigid and brittle, and those, which clothe the stem of the former, correspond very nearly in figure with the perichæatial ones of the latter. The form of the calyx is the same in both, as is also that of the capsule.

BRITISH JUNGERMANNIÆ.

(*J. setiformis*.)

REFERENCES TO THE PLATE.

FIG.

1.	<i>J. setiformis</i> β , natural size.	
2.	<i>J. setiformis</i> α , natural size.	
3.	Portion of the stem of β , magnified	6
4.	Leaf of the same	4
5.	Portion of the fertile stem of α	5
6.	Smaller part of the same	4
7, 8.	Leaves	3
9.	Apex of a leaf	1
10.	Perichæatial leaf	3
11.	Calyx, longitudinally dissected	4
12.	Calyptra and barren pistilla	2
13.	Capsule in a young state	2
14.	Barren pistillum	1



Jungermannia nemorosa.
Scapania nemorosa L. Dum

JUNGERMANNIA NEMOROSA.

(TAB. XXI.)

JUNGERMANNIA, caule erecto, subdichotomo: foliis bifariis, inæqualitèr bilobis, dentato-ciliatis; lobis conduplicatis; inferioribus majoribus, obovatis; superioribus subcordatis, obtusis: fructu terminali; calycibus oblongis, incurvatis, compressis; ore truncato, dentato-ciliato.

Jungermannia nemorosa. LINN. *Sp. Pl.* II. p. 1598. POLLICH, *Pal.* III. p. 187. LEERS, *Herb.* p. 250. WEBER, *Spic. Fl. Goet.* p. 140. OEDER, *Enum. Pl. Fl. Dan.* p. 41. HEDWIG, *Theoria.* p. 156. t. 17. ALLIONI, *Fl. Ped.* II. p. 312. VILLARS, IV. p. 923. ROTH, *Germ.* III. p. 389. SCHRADER, *Samml. Lief.* II. p. 5. HOFFMANN, *Germ.* II. p. 85. HUDS. *Angl.* p. 512. LINN. *Syst. Nat. ed. Gmel.* II. p. 1350. LAMARCK, *Encycl.* III. p. 281. WITH. III. p. 857. LAMARCK, *Fl. Fr. ed. 2. v. II.* p. 435. *Engl. Bot.* t. 607. LAMARCK, *Fl. Gall.* p. 93.

Jungermannia nemorea. LINN. *Syst. Nat.* II. p. 706. SCOPOLI, *Carn. ed. 2da.* II. p. 344. WEIS, *Plant, Crypt.* p. 131.

Jungermannia resupinata *Engl. Bot.* t. 2437.

Jungermannia nemorosa, foliis acutioribus, auritis, tenuissimè denticulatis, flore insidente pediculo breviori. MICHELI, *Nov. Gen.* p. 7. t. 5. f. 8.

Jungermannia alpina, supina, foliis acutioribus, auritis, tenuissimè denticulatis, flore insidente pediculo breviori. MICHELI, *Nov. Gen.* p. 7.

Lichenastrum auriculatum, pinnis minoribus, crenatis. DILL. *Musc.* t. 71. f. 18. RUPP. *Jen.* p. 402.

Lichenastrum auriculatum, pinnulis rotundis, crispum. DILL. *Musc.* t. 71. f. 19.

Jungermannia foliis bipartitis, auriculatis, supremis punctiferis. HALL. *Helv.* III. p. 58.

β. PURPURASCENS; foliis purpurascentibus.

Jungermannia cochleariformis. WITH. III. p. 858.

Jungermannia purpurea. *Engl. Bot.* t. 1023. (excluding the magnified figure on the left side of the plate, which belongs to *J. albicans*.)

Jungermannia alpina, palustris, purpurea, cambrica, foliis rotundioribus auritis, tenuissimè denticulatis. MICHELI, *Nov. Gen.* p. 6. t. 5. f. 16.

Lichenastrum auriculatum, *Ornithopodii minoris*, pinnulis ciliatis. DILL. *Hist. Musc.* t. 71. f. 21.

γ. RECURVIFOLIA; foliorum lobis lobulisque recurvatis.

δ. DENUDATA: foliorum lobis lobulisque subintegerrimis.

(*J. nemorosa.*)

BRITISH JUNGERMANNIÆ.

HAB. In woods, on hedge-banks, and among rocks.— β , on the Scotch mountains abundant, chiefly in much exposed and very moist situations.—Rivulets and bogs on the mountains of North Wales. *Mr. Griffith.*—Mountains near Bantry. *Miss Hutchins.*—About Keswick. *Mr. Lyell.*— γ was found by the *Rev. R. B. Francis*, in Wales.— δ grows, intermixed with α , in woods and heathy places.—At Edgefield. *Rev. R. B. Francis.*—Woods near Norwich.

OBS. The fructification is observable during the greater part of the summer months, among the mountains.

PLANT growing for the most part in densely-matted tufts, of two or three inches in diameter.

Root, a few minute pellucid fibres, proceeding in bundles from the lower part of the stem. *Stems* erect, varying from one to three, or even four inches in length, about the tenth of a line in diameter, generally of a dirty brown color, but sometimes a yellowish red, and occasionally in wet situations becoming quite black, twice or thrice divided in an irregularly dichotomous manner; besides which, they also produce innovations, which are, like the parent branches, flexuose and filiform.

Leaves (f. f. 5. 6. 7) bifarious and distichous, rather loosely imbricated, patent, their margins strongly dentato-ciliate; at the base of the plant they are the smallest, being there scarcely half a line in length, but they gradually increase in size as they approach the extremity, where they are nearly one line long; they are semi-amplexicaul, decurrent, divided to within one third of the base into two unequal conduplicate lobes *, of which the superficies is parallel with the stem, and, consequently, vertical with regard to the horizon; the lower one is twice the size of the upper, obovate, more or less acute, slightly convex above, and appressed to the under side of the stem; the upper lobe or *lobulus* is subcordate, obtuse, a little convex, with its base embracing the stem, so as entirely to conceal it in those parts where the leaves are at all crowded; their *texture* is delicate; the *cellules* (f. 5) compact, very minute, roundish; the *color* a pale yellow green, more or less inclining to brown; in β , a deep purple.

Perigonial leaves closely imbricated, and much resembling the cauline ones, except that their base is more ventricose, and their apices always recurved.

The *perichætal leaves* differ from the rest only in being of a larger size, and in having the margins frequently recurved.

MALE FRUCTIFICATION. *Anthers* (f. f. 9. 10. 11) situated in the axillæ of the perigonial leaves, ovate or roundish, when perfect of an olive-green color, but appearing, after the discharge of the pollen, a pellucid, reticulated, extremely delicate membrane. Each is situated on a transparent, transversely striated footstalk, which scarcely exceeds the anther in length. In

* It was my intention to have adopted the term *auricle* for the upper and generally lesser division of the leaves, in this species and its affinities, in compliance with the Linnæan terminology. So little, however, does this part differ, in one or two of the species, from the lower lobe, that it appears to me I shall render my descriptions more simple and intelligible, by considering the leaves in question as divided into two lobes, which are either *equal* in size or *unequal*. In the latter case, the larger one may be termed *lobus*, and the smaller, *lobulus*, as suggested by Dr. Smith in *English Botany*, p. 2231. The word *auricle*, might, I think, with more propriety, be confined to those lesser divisions of the leaves of *Jungermannia*, which, in every part of the plant, essentially differ, in figure and size, from the larger division; remarkable instances of which may be seen in *J. Hutchinsiae*, *J. Tamarisci*, and *J. dilatata*. Yet, even in the species of this very natural division of the family, the *auricles* of the perichætal and of the young terminal leaves sometimes form an exception to this rule.

BRITISH JUNGERMANNIÆ.

(*J. nemorosa*.)

the axillæ of the perigonial leaves, also, and intermixed with the anthers, are frequently seen jointed, simple or slightly branched filaments (f. f. 11. 12); but whether they belong to the fructification, or are to be considered as some parasite (perhaps a *Conferva*), I am unable to determine. I have found them on British specimens, as well as on others, which I have received from Sweden. Had I not seen, in some of them, small branches, I should have supposed they had been abortive footstalks; for their structure, in other respects, seems to be exactly the same.

FEMALE FRUCTIFICATION terminal upon the stems and branches.

Calyx (f. 4) about a line and a half long; at its base narrow and cylindrical, but thence gradually increasing in width towards the extremity, which is half a line in diameter: it is remarkably incurved in its early state, but becomes erect when the capsule is protruded. The mouth is truncate and dentato-ciliate. In *color* and *texture* it resembles the leaves.

Calyptra (f. 13) a white, thin, delicate membrane, of a pyriform figure, marked with rather large reticulations: the *style* is short and tubular. Of *abortive pistilla* (f. 14) there are a few at the base of the calyptra, linear, greyish, longitudinally and transversely striated, their *mouth* slightly dilated.

Peduncle short, scarcely exceeding twice the length of the calyx, white, cellulose, shining.

Capsule oblongo-ovate, deep purplish brown, opening into four equal, lanceolate valves, which on their outer surface are longitudinally and transversely furrowed.

Seeds and spiral filaments (f. 15) numerous, of a deep fulvous color: the former exactly spherical; the latter composed of a double *helix*, of a greater length than is usual in the genus.

Gemmæ (f. 7) are not uncommon on this plant, in the month of July, forming a compact granulated wart or tubercle, at the extremity of both the lobes of the leaves which are situated at the apex of the stems: at first, they are green; in a more advanced period, brown; and at length almost black, in which state the particles, of which they are composed, more readily separate, and are seen, under a high power of the microscope, to be oblong, pellucid, and by no means angular.

Var. β (f. 16) scarcely differs from *α*, but in the deep purple color of the whole plant. In both kinds the figure of the leaf is subject to some slight variation, from obovate to rotundo-obovate.

The *lobules*, in the lower part of the plant, appear occasionally to have the teeth nearly obsolete. The *Var. γ* has a crisped and inelegant appearance, from the circumstance of the lobes and lobules of the leaves being by no means conduplicate, but irregularly bent back, as is represented at (f. f. 1. and 8). The *color*, too, is more inclining to a yellowish-brown.

Var. δ. (f. f. 17. 18) approaches, in the figure of its leaves, *Jungermannia umbrosa*, but may be distinguished by the greater proportional length and slenderness of the plant, in having its leaves more distantly placed, and in these being for the most part quite entire at the margins. The upper leaves, indeed, are slightly dentated. It is an extremely minute variety, scarcely attaining to half an inch in length, and is always found intermixed with *α*. The *color* of the stem and leaves is a very pale yellowish-green.

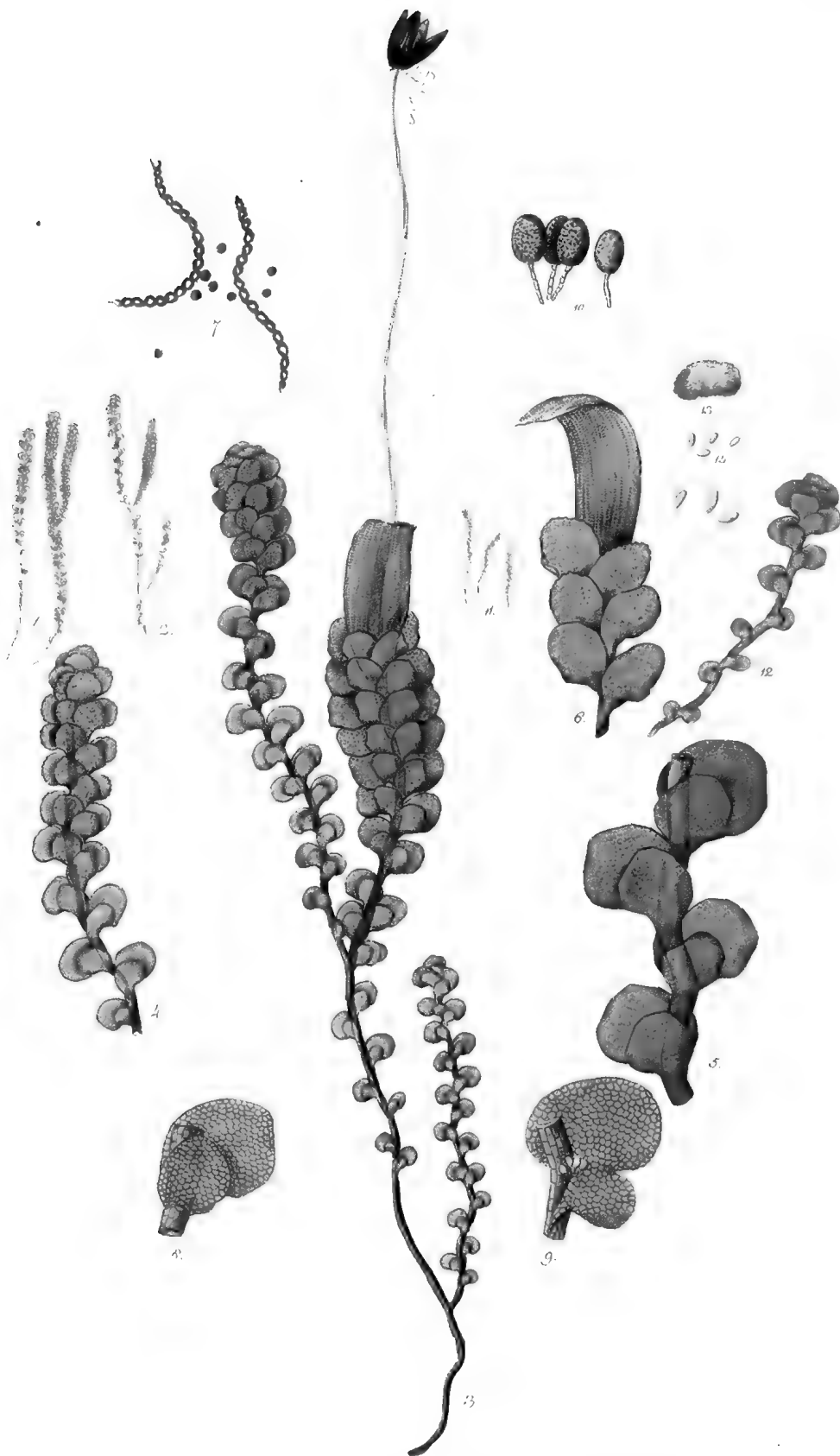
The strongly dentato-ciliated margins of the leaves in *J. nemorosa* will readily serve to distinguish it from its associates, and especially from *J. undulata* and *J. umbrosa*, to which, in general habit and mode of growth, it bears considerable affinity. Micheli appears to be the earliest writer who has noticed this species, and has twice represented it in t. 8, of his *Genera Plantarum*. This acute observer has also remarked the Gemmæ, which he mistook for seeds, but his figure of them is by no means accurate. Hedwig has admirably illustrated this part, though he has likewise fallen into an error in considering it to be the male flower, from which it differs essentially in form, structure, and situation. Dillenius', t. 71, f. 18, is very characteristic of the plant, infinitely more so than his f. 21, of the same plate; which, however, I have ascertained, by an examination of the original specimens, to be a variety possessing a purplish tinge. Tab. 71. f. 19, also belongs to the same species.

Dr. Smith and Withering have confounded the purple variety of this species with *J. purpurea*, of WEIS (*Mnium Jungermannia*, LINN.), with which it corresponds in color and place of growth, though in every other respect it is widely different. The three figures above quoted, in *English Botany*, unquestionably all belong to the same plant.

REFERENCES TO THE PLATE.

FIG.

1.	<i>J. nemorosa</i> , γ (male plant), natural size.	
2.	Female plant, natural size.	
3.	Female plant, magnified	6
4.	Upper extremity of a female plant, seen from behind	5
5.	Leaf	3
6.	Lower leaf	5
7.	Leaf with Gemmæ	4 and 1
8.	Leaf of <i>J. nemorosa</i> , var. γ	5
9, 10, 11.	Anthers and filaments	1
12.	Branched filament	1
13.	Calyptra	2
14.	Abortive pistilla	1
15.	Seeds and spiral filaments	1
16.	<i>J. nemorosa</i> , var. β	5
17.	<i>J. nemorosa</i> , var. δ , natural size.	
18.	<i>J. nemorosa</i> , magnified	6
19.	<i>J. nemorosa</i> , var. δ . leaf of	4



Jungmannia undulata L.
Jungermannia undulata L.

BRITISH JUNGERMANNIÆ.

(*J. undulata*.)

JUNGERMANNIA UNDULATA.

(TAB. XXII.)

JUNGERMANNIA, caule erecto, subdichotomo; foliis bifariis, inæqualitèr, bilobis, undulatis, integerrimis; lobis subrotundis, conduplicatis, inferioribus majoribus: fructu terminali; calycibus oblongis, incurvatis, compressis; ore truncato, integerrimo.

Jungermannia undulata. LINN. *Sp. Pl.* II. p. 1598. *Syst. Nat.* II. p. 705. POLLICH, *Pal.* III. p. 186. WEIS, *Plant. Crypt.* p. 120. WEBER, *Spic. Fl. Goet.* p. 139. OEDER, *Enum. Pl. Fl. Dan.* p. 41. SCHRANK, *Baiersche Flora*, II. p. 497. HOFFMANN, *Germ.* II. p. 85. ROTH, *Germ.* III. p. 389. LAMARCK, *Encycl.* III. p. 281. WITH. p. 856. LINN. *Syst. Nat. ed. Gmel.* II. p. 1350. HUDS. *Angl.* p. 512. LIGHTF. *Scot.* II. p. 776. LAMARCK, *Fl. Fr. ed. 2. v. II.* p. 435. LAMARCK, *Fl. Gall.* p. 93. *Engl. Bot.* 225. (the fructified specimens in the figure, appear to belong to *J. scalaris*).

Hepatica saxatilis, undulata, seminifera. VAILLANT, *Bot. Par.* p. 98. n. 9. t. 19. f. 6?

Lichenastrum pinnis auriculatis majoribus et non crenatis. DILL. *Musc. t.* 71. f. 17.

HAB. Wet situations in various parts of the kingdom; in the alpine districts most abundant.

OBS. It produces fructification in May and June. Mr. Lyell finds the male fructification in July.

PLANT growing in large and closely matted tufts of a considerable size.

Root consisting of a few simple, short, pellucid fibres, produced from the lower part of the **Stems**, which are from one to three or four inches high, either simple, or once or twice divided, with nearly erect, dichotomous branches; their *color* in the young state a dirty green, at a more advanced period almost black; sometimes also a yellowish-brown: their *texture* rigid, brittle when dry.

Leaves (f. f. 5. 8) disposed as in *J. nemorosa*, in a bifarious and distichous manner (f. f. 3. 5): the lower ones small, most distantly placed; the upper ones more crowded, slightly imbricated, from a line to a line and a half long; all of them patent, but, at the base, decurrent and semi-amplexicaul, divided into two unequal conduplicate, vertical lobes, the lower one of which is the largest, and appressed to the hinder part

(*J. undulata*.)

BRITISH JUNGERMANNIÆ.

of the stem; the upper one, or *lobule**, is smaller by one half: they are both of a roundish figure, sometimes a little pointed, slightly waved or undulated, the margins entire, or at most obscurely crenate in a few of the terminal ones. The *texture* is, for so large a plant, peculiarly thin and delicate; the *reticulation* small, composed of roundish *cellules*. The *color* varies from its most usual appearance of dark and dull green, with often a purplish tinge, to deep purple, and even almost to black.

The *Perigonial Leaves* (f. f. 4. 9) are scarcely distinguishable from the common cauline ones, except that they are more crowded and imbricated; their base, too, is somewhat ventricose. They are situated at or near the extremity of a stem.

Perichatial Leaves (f. 6) somewhat larger than the rest, which they in other respects resemble, and are, like them, either entire, or slightly crenate; but so slightly as to be visible only with a microscope.

MALE FRUCTIFICATION (f. 9) situated in the axillæ of the perigonial leaves. *Anthers* (f. 10) small, in clusters of from three to five or six, each of them ovate, pellucid, faintly reticulated, filled with a greenish pollen; the *footstalk* somewhat longer than the anther, white, pellucid, and transversely jointed.

FEMALE FRUCTIFICATION (f. f. 2. 3. 6) terminal upon the stems and larger branches.

Calyx (f. 6) about two lines long; its base is narrow, attenuated, and cylindrical, thence it becomes broader, compressed and incurved towards the mouth, which is truncate and entire. As the fructification advances, the calyx becomes nearly erect. In *color* it resembles the leaves. Its *substance* is less delicate.

Calyptra oblong, somewhat pyriform, with a short tubular *style*, and a few *barren pistilla* at its base.

Peduncle half an inch long, white, shining, cellulose, often having a twisted appearance, terminated by the ovato-oblong

Capsule of a deep brown or chocolate color, which splits into four equal, nearly lanceolate valves.

Seeds and Spiral Filaments (f. 7) much resembling those of *J. nemorosa*; but the filaments are scarcely so much lengthened.

Upon the summit of Ben Nevis, in the month of July, I found *Gemmæ* (f. f. 12. 14) upon this species, collected together in ovate masses, one or two of which were situated in the terminal cluster of leaves: their *color* was a pale yellow green; each particle was oblongo-ovate, pellucid, and entirely free from angles.

Vaillant's description and figure, above quoted, are so imperfect, that, as Dr. Smith justly observes, they cannot with certainty be referred to any thing. His account of the *gemmæ*,

* Some of the terminal leaves, as is remarked by Dillenius, have the upper lobe nearly of the same size as the under one; but this appears to me to apply only to such as have not reached their full size, and are almost concealed by the older surrounding ones.

however, which are evidently what he took for the seeds, very exactly correspond with those of our plant. After speaking of the leaves, he says, "L'extrémité de ces feuilles forme des espèces de rosettes, dans le milieu des quelles se voyent de petits grains jaunâtres et transparents, qui selon toutes les apparences sont les semences de cette plante." Dillenius has so well described the structure of the leaves of this species, that I shall here quote his words; "Aquæ immersa obsoletè ex fusco viridia folia sunt pellucida, superiora versus majora, inferiora versus minora, subrotunda, suprâ convexa, infrâ concava, e duabus laminis ad basin unitis et complicatis composita, laminâ minori superiori, seu ipsi pinnæ impositâ. Ea porro differentia observatur, quod extrema folia e laciniis penè æqualibus constant. Quoniam folia satis lata sunt, hæc foliorum structura facilè percipitur, neque vero absimile, sequentium specierum (*J. nemorosa resupinata et albicantis*), folia similiter formata esse, licet ob exiguitatem non tam facilè distinguantur. Pinnæ per lentem non crenatæ apparent."

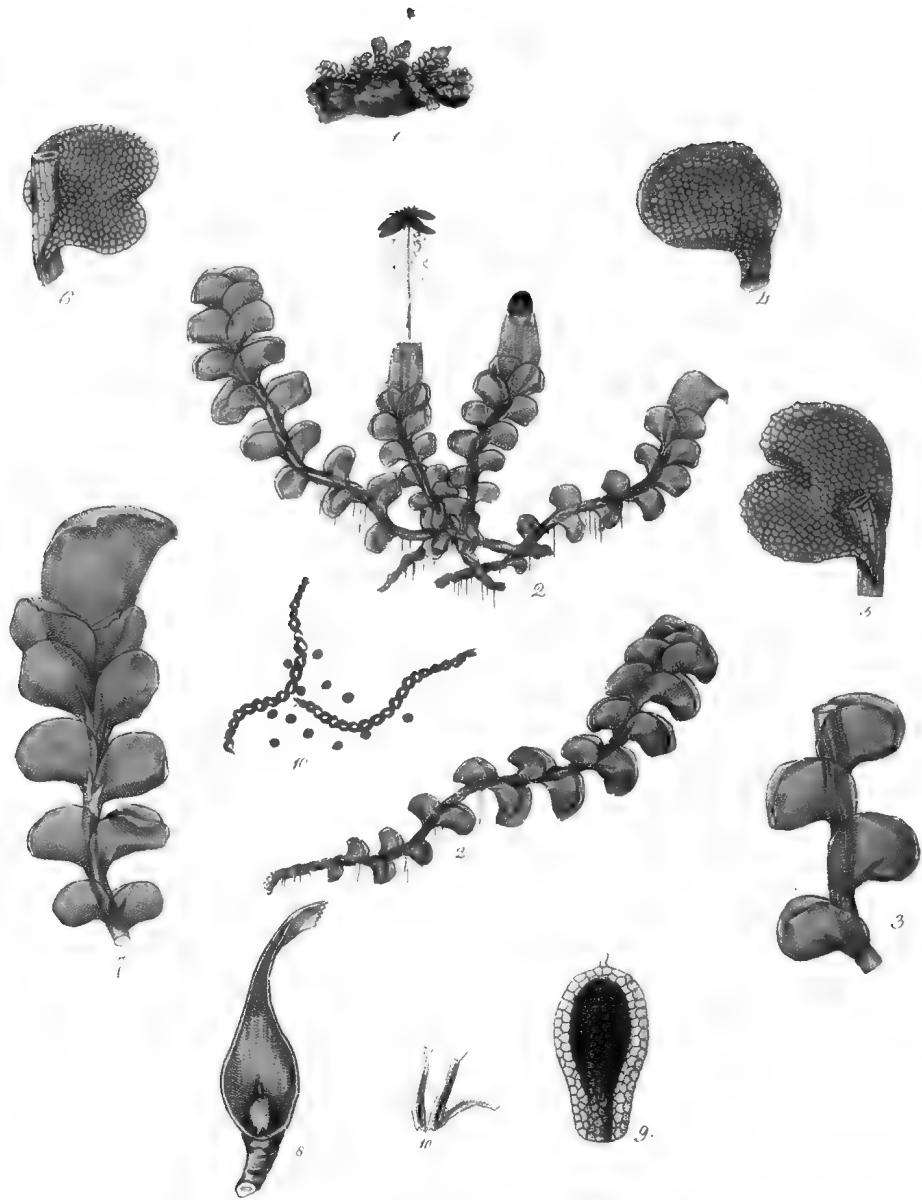
The erect mode of growth, much larger size of the plant, and the smallness of the lobes compared with the leaves, are marks by which *J. undulata* may always be known from *J. resupinata*; while the entire margins of the leaves and mouth of the calyx, as well as the more delicate structure and undulated appearance of the former (which is particularly the case when the plant is dry), will equally distinguish it from *J. nemorosa*. The gemmæ also differ both in color and situation.

Pollich remarks, that the barren surculi of this plant produce at their apices "globulos nigricantes, pusillos, sex aut septem, etiam plures, sessiles," which accord rather with the gemmæ of *J. nemorosa* than with those that I have seen of *J. undulata*.

REFERENCES TO THE PLATE.

FIG.

- | | | |
|-----|------------------------------------------------------------------------------------------------------------|---------|
| 1. | <i>J. undulata</i> , male plants, natural size. | |
| 2. | Female plants, natural size. | |
| 3. | Female plant, magnified | 6 |
| 4. | Extremity of a male plant | 6 |
| 5. | Portion of a stem with its leaves | 4 |
| 6. | Extremity of a female plant | 5 |
| 7. | Seeds and spiral filaments | 1 |
| 8. | Perigonial leaf | 3 |
| 9. | Perigonial leaf, with the lobule expanded for the purpose of exhibiting the situation of the anthers | 3 |
| 10. | Anthers | 1 |
| 11. | Gemmaceous plants of <i>J. undulata</i> , natural size. | |
| 12. | Gemmaceous plant magnified | 6 |
| 13. | Mass of gemmæ, removed from the plant | 4 |
| 14. | Gemmæ | 2 and 1 |



Jungermannia resupinata.

JUNGERMANNIA RESUPINATA.

(TAB. XXIII.)

JUNGERMANNIA, caule procumbente, simpliciusculo: foliis bifariis, rotundatis, subæqualitèr bilobis, integerrimis; lobis conduplicatis: fructu terminali; calycibus oblongis, incurvatis, compressis; ore truncato, minutissimè crenato.

Jungermannia resupinata. LINN. *Sp. Pl.* II. p. 1598. *Syst. Nat.* II. p. 706. *Fl. Suec.* p. 400. POLLICH, *Pal.* III. p. 188? WEBER, *Spic. Fl. Goet.* p. 141. LEERS, *Herb.* p. 250. SCHRANK, *Baiersche Flora.* II. p. 498. OEDER, *Enum. Pl. Fl. Dan.* p. 41. HOFFMANN, *Germ.* II. p. 84. ROTH, *Germ.* III. p. 391. HUDS. *Angl.* p. 512. LIGHTF. *Scot.* II. p. 776. LINN. *Syst. Nat. ed. Gmel.* II. p. 1350. LAMARCK, *Encycl. Method.* III. p. 281. WIRTH, p. 857. LAMARCK, *Fl. Fr. ed. 2. v. II.* p. 435. LAMARCK, *Fl. Gall.* p. 93.

HAB. About Edgefield, on a loamy soil, and on the heath at Hempstead-hill, Norfolk. *Rev. R. B. Francis.*—Not unfrequent in various parts of Norfolk and Suffolk, in shady places, under the trailing stems of *Ericæ*.

OBS. It produces capsules in May and June. In the early part of the spring, Mr. Francis finds plants bearing anthers.

PLANT, when fertile, generally found in small and rather dense tufts: barren individuals more frequently grow distant and straggling.

Root a few whitish, pellucid fibres, proceeding here and there from nearly the whole length of the under side of the plant.

Stems from half to three-quarters of an inch long, simple, sometimes, though rarely, once or twice forked, flexuose, procumbent, their apices erect only when in a state of fructification, or when the shoots are crowded together. Their color is a reddish brown.

Leaves, in fertile plants, rather closely imbricated, especially towards the extremity; in barren ones, generally more distantly placed, always bifarious, horizontal, about half a line long, of a roundish figure (f. f. 5. 6), divided into two nearly equal, conduplicate, and, with regard to the stem, vertical lobes, which, however, are not so closely folded as those of *J. nemorosa* and *J. undulata*: each of them is convex on its outer surface;

(*J. resupinata*.)

BRITISH JUNGERMANNIÆ.

on the lower part of the plant the *inferior lobe* is somewhat larger than the other; the rest of the leaves have their lobes equal in size, and every where entire, except that some of the terminal ones, with the assistance of a good microscope, may be observed to be very minutely, though sharply, crenate; at the base they are decurrent and semi-amplexicaul, so that, except where they are distantly placed, the conduplicate leaves entirely sheath and conceal the stem on both sides. Their *color* is a yellowish brown, with but little of a green hue. Their texture less delicate than that of the leaves of *J. undulata*; the *cellules* are small and roundish.

Perigonial leaves, situated at or near the extremity of a stem, and like the cauline ones, except in having a ventricose base, and in being generally more crowded.

The *Perichatial leaves* differ only in a slight degree from the rest; their *lobes* are equal in size, and faintly toothed or crenate (f. 5).

MALE FRUCTIFICATION placed in the axillæ of the perigonial leaves. *Anthers* exactly similar to those of *J. nemorosa* and *undulata*, growing in clusters of from five to six or seven in the axilla of each leaf.

FEMALE FRUCTIFICATION terminal.

Calyx (f. 8) three quarters of a line, or more, in length, at the base narrow and cylindrical, thence becoming depressed, and at the extremity quite flat: in a young state it is much incurved, but, as the fructification advances within, it becomes erect and much less depressed. The mouth is truncate and minutely crenate.

Calyptra (f. 9) obovate, whitish, pellucid, reticulated, terminated by a short *style*. At its base are a few *abortive pistilla* (f. 10), linear, or a little swelling towards the base, marked all over with longitudinal and transverse lines: their *mouth* is a little expanded.

Peduncle scarcely half an inch long, white, pellucid, cellulose.

Capsule ovate, deep brown.

Seeds (f. 10) of a fulvous brown, spherical; *spiral filaments* (f. 10) of the same color, composed of a double *helix*.

Although the Dillenian figure (t. 71. f. 19) has been quoted by almost every writer upon the subject, as a synonym to this species, yet it is certain that it only represents a small variety of *J. nemorosa*. It requires, however, to be remarked, that in the original specimen there are no traces of any lateral fructification, as the plate and description would lead us to imagine. With regard to the other references, which I have been led to retain, I regret to say that it is by no means in my power to speak with the certainty I wish. Pollich's plant is very doubtful, and I suspect that both this author, and Lightfoot, may have confounded *J. resupinata* with *J. undulata*. Weber's description accords well with our species, except where he remarks that the leaves are "ovata, acuminata." Of the auricles he justly observes that they are "in superiori surculorum superficie alternæ, concavæ, foliis non multum minores, rotundatæ." Leers has done no more than copy the Linnæan character. Roth, as usual original, says that

the species is distinguished by the auricles being but little less than the leaves, which is certainly true; but he unfortunately gives a second character, quite the contrary, the lateral situation of the calyces, which are undoubtedly terminal. Lamarck's descriptions are particularly imperfect and unsatisfactory.

J. resupinata has in many respects a resemblance to *J. undulata*, but is to be distinguished from it by its much smaller size, its procumbent mode of growth, and its nearly equal, concave, conduplicate, but not closely appressed, lobes. The entire margins of its leaves, and their figure, will always prevent it from being confounded with *J. nemorosa* and *J. umbrosa*. *J. saxicola*, of Schrader, a plant very abundant on the Continent, but one which has not yet been detected in Britain, approaches the present species in color, and in the division of the leaf into two nearly equal lobes. Of this plant, however, the leaf is concave, and the lobes not conduplicate, but remarkably involute and pointed.

It has been in another place observed, that the figure in *English Botany* named *J. resupinata*, belongs to *J. nemorosa*: Dr. Smith, like Roth, probably relying upon Dillenius, describes the fructification of his species as usually growing from the side of the stem; but this, as far as I have had the opportunity of remarking, is always, as above remarked, terminal, though it is probable that it may occasionally have the appearance of being lateral, when a young shoot originates immediately beneath it.

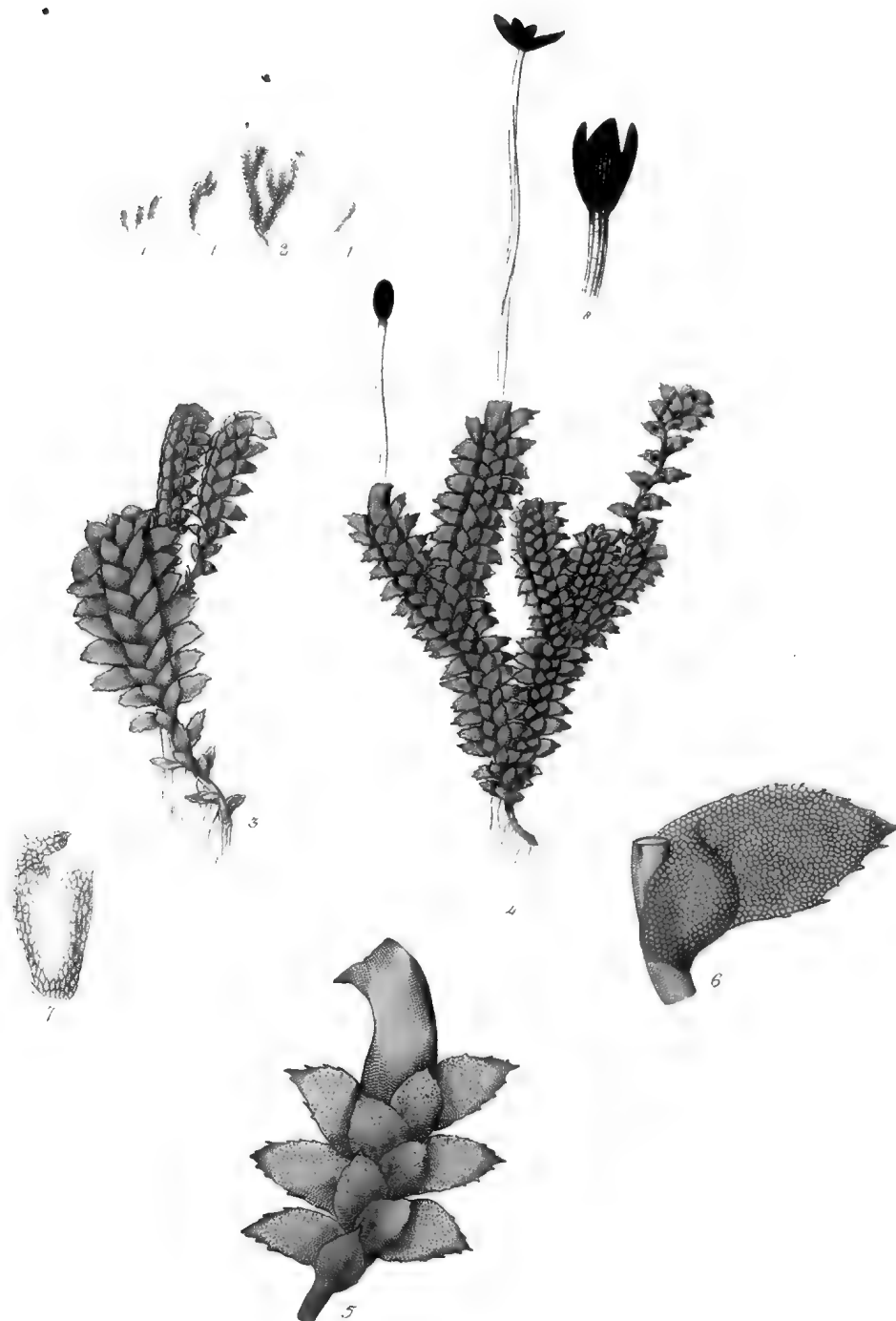
The male fructification I had no opportunity of seeing, till some time after the plate was engraved, so that it could not there be inserted.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. resupinata</i> , natural size.	
2, 2. The same, magnified	6
3. Portion of the stem and leaves	4
4. Leaf	3
5. Perichætal leaf, with the lobes expanded	3
6. Cauline leaf, with the lobes expanded	3
7. View, from behind, of the extremity of a fertile stem	4
8. Side view of a calyx, longitudinally dissected	3
9. Calyptra containing the young capsule	2
10. Barren pistilla	1
11. Seeds and spiral filaments	1





Jungermannia umbrosa.
Sepp. et. un. ros. Schrad. 227.

JUNGERMANNIA UMBROSA.

(TAB. XXIV.)

JUNGERMANNIA, caule erectiusculo, subramoso: foliis bifariis, inæqualitèr bilobis; lobis conduplicatis, apice serratis, acutis; inferioribus majoribus, ovatis; superioribus rotundato-ovatis: fructu terminali; calycibus oblongis, incurvatis, compressis; ore truncato, integerrimo.

Jungermannia umbrosa. SCHRADER, *Samml.* II. p. 5. ROTH, *Germ.* III. p. 390.

HAB. On Ben Nevis, and in the Den of Rechip, near Dunkeld.—Mountain, near Powerscourt Waterfall, Ireland. *Mr. Mackay.*—Gathered in fructification, in the months of April and May, upon Boulacross Mountain, in the county of Wicklow, by *Dr. Taylor* and *Mr. Mackay*.

PLANT growing in rather small and dense patches, among other *Jungermannia* and Mosses.

Root consisting of a number of minute fibrous radicles, principally issuing from the lower part of the plant.

Stems short, generally not much exceeding half an inch in length, erect or ascendent, flexuose, of a pale reddish-brown color, simple, or once or twice dichotomous; but producing also young lateral shoots, sometimes singly, sometimes two or three together, from near the extremity (f. 3).

Leaves (f. f. 5. 6) bifarious, distichous, horizontal, rather closely placed, imbricated, divided into two unequal, conduplicate, appressed, and vertical lobes, of which the inferior is much the largest, and is half a line long, ovate, acute, recurved, especially in those that approach the apex of the stem (f. 3), and sharply serrated, though the serratures are irregular in size and distance, and do not extend more than half way down the margins from the point: the superior lobe is not so large by two-thirds as the inferior; it is of a rotundo-ovate figure, acute, its exterior surface convex, its apex sharply, but unequally, serrated. The color of the leaves is a pale and bright yellow green, sometimes inclining to brown, the terminal ones often tipped with a fine purplish tinge. The texture is rather firm and rigid. The cellules roundish, minute.

In the perigonal leaves, which I have only hitherto observed to be situated about the middle of the stem, the lobes are almost equal in size, and not at all serrated. These are closely imbricated.

The perichætal leaves resemble the cauline ones in every thing but in having the inferior lobes more recurved, and the superior about half their size.

(*J. umbrosa*.)

BRITISH JUNGERMANNIÆ.

MALE FRUCTIFICATION axillary. *Anthers* in small clusters of three or four in each perigonal leaf, ovate, reticulated, situated upon a short, transversely-striated, pellucid footstalk.

FEMALE FRUCTIFICATION terminal upon the stems and branches.

Calyx (f. 5) nearly three quarters of a line long, at the base cylindrical, or, when the germen has arrived at its full size, ventricose, thence becoming depressed and quite flat at the mouth, which is truncate and entire. In *texture* and *color* the calyx corresponds with the leaves.

Calyptra (f. 7) obovate, membranous, reticulated, tipped with a short tubular *style*. At its base are a few short and nearly linear *barren pistilla*.

Peduncle about half an inch long, white, succulent, striated transversely and longitudinally.

Capsule (f. 8) ovate, brown, opening into four equal, ovato-lanceolate valves.

Seeds and *spiral filaments* fulvous brown; the former spherical, the latter composed of a double *helix*.

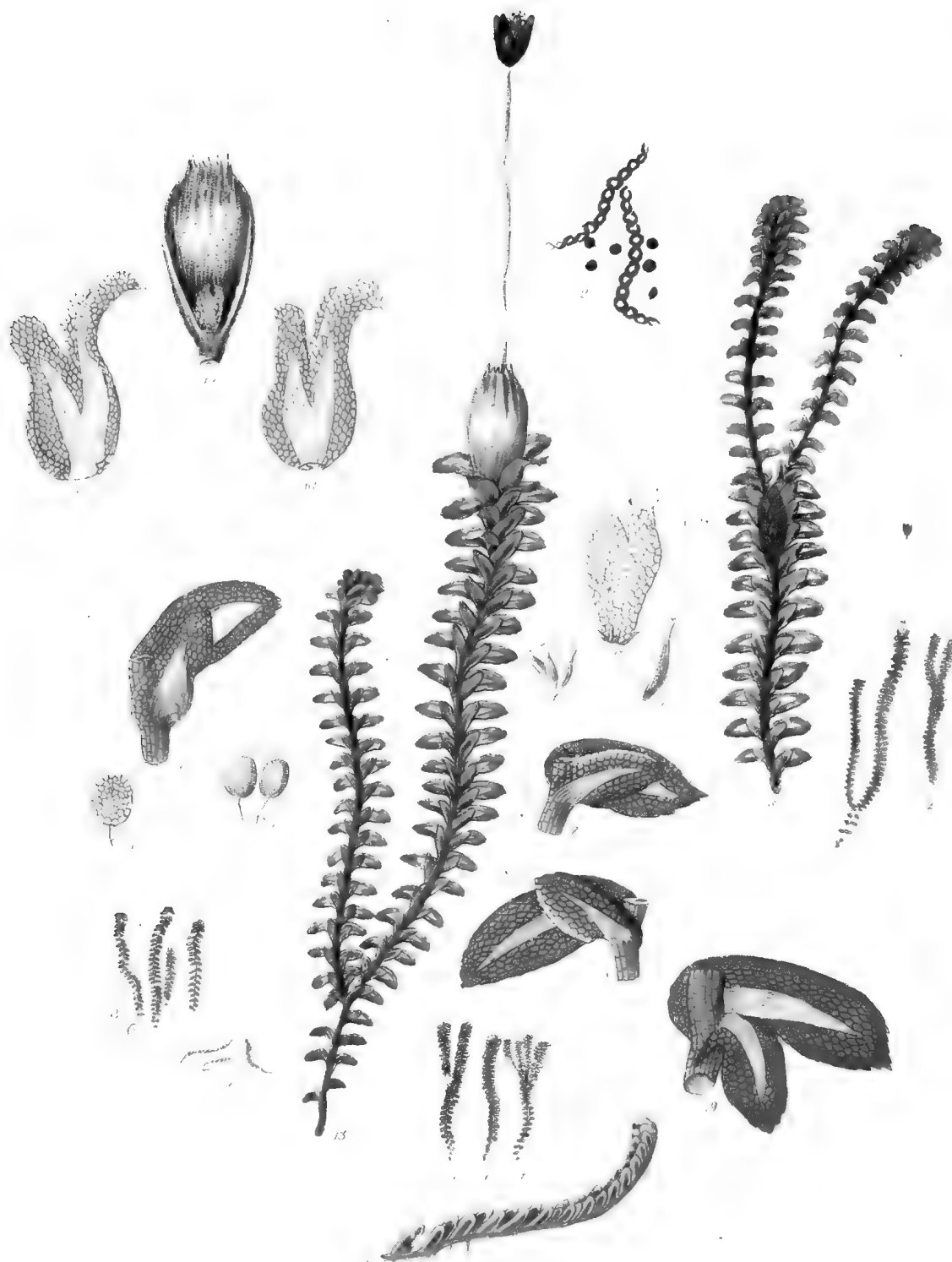
At the time when the plate of *J. umbrosa* was engraved, my Scotch specimens of this elegant species of Jungermannia, were the only ones known as British; but I have since been able to make considerable additions to my description of the plant, by means of others which I have lately received from Dr. Taylor and Mr. Mackay, gathered in a fine state, and containing both male and female fructification. All of them agree well with authentic individuals sent to Mr. Turner by Dr. Schrader, as well as with the admirable character of it, given by the latter gentleman in his *Syst. Samml. Krypt. Gewäscbe*.

The plant has a peculiarly handsome appearance, from the recurved leaves at the apices of the stems and branches, which is more striking in the young shoots. It is distinguished from its associate, *J. nemorosa*, by the more narrow lobes of the leaves, their more ovate figure, and especially by their being truly serrated (by no means dentato-ciliate), and by the entire mouth of the calyx.

REFERENCES TO THE PLATE.

FIG.

- | | |
|-----------------------------------------------------------|---|
| 1, 1, 1. <i>J. umbrosa</i> , barren plants, natural size. | |
| 2. Fertile plant, natural size. | |
| 3. Barren plant, magnified | 6 |
| 4. Fertile plant | 6 |
| 5. Extremity of a fertile shoot | 5 |
| 6. Leaf | 2 |
| 7. Calyptra | 1 |
| 8. Capsule empty, having discharged its seeds | 2 |



Jungermannia albicans.
Jungermannia albicans L. var.

JUNGERMANNIA ALBICANS.

(TAB. XXV.)

JUNGERMANNIA, caule erecto, subdiviso: foliis bifariis, inæqualitèr bilobis; lobis conduplicatis, medio pellucidis, apice serratis; inferioribus majoribus, subacinaciformibus; superioribus oblongo-ovatis, acutis: fructu terminali; calycibus obovatis, cylindraceis; ore contracto, dentato.

Jungermannia albicans. LINN. *Sp. Pl.* p. 1599. *Syst. Nat.* II. p. 706. *Fl. Suec.* p. 401. POLLICH, *Pal.* III. p. 189. WEIS, *Plant. Crypt.* p. 122. WEBER, *Spicil. Fl. Goet.* p. 143. OEDER, *Enum. Pl. Fl. Dan.* p. 42. LEERS, *Herb.* p. 250. ALLIONI, *Fl. Ped.* II. p. 313. SCOPOLI, *Fl. Carn.* II. p. 347. HOFFMANN, *Germ.* II. p. 84. ROTH, *Germ.* III. p. 391. LIGHTF. *Scot.* II. p. 777. HUDS. *Angl.* p. 513. LINN. *Syst. Nat. ed. Gmel.* II. p. 1350. WITH. p. 857. LAMARCK, *Encycl.* III. p. 282. LAMARCK, *Fl. Fr. ed. 2. v. II.* p. 436. LAMARCK, *Fl. Gall.* p. 93. *Engl. Bot.* t. 2240 and t. 1023 (the left hand figure).

Jungermannia varia. LINN. *Sp. Pl.* p. 1601. *Syst. Nat.* II. p. 706. POLLICH, *Pal.* III. p. 199. SCHREBER, *Spic. Fl. Lips.* p. 104. OEDER, *Enum. Pl. Fl. Dan.* p. 42. ROTH, *Germ.* III. p. 378. HUDS. *Angl.* p. 516. WITH. p. 862. LINN. *Syst. Nat. ed. Gmel.* II. p. 1352. LAMARCK, *Encycl.* III. p. 285. MICHAUX, *Fl. Bor. Am.* II. p. 279?

Lichenastrum Trichomanis facie, capitulis e foliorum summitate enascentibus, minus. RAI Syn. p. 112.

Lichenastrum foliis variis. RAI Syn. p. 113.

Jungermannia repens, foliis cordatis, carinatis. MICHELI, *Nov. Gen.* p. 8. t. 5. f. 9.

Hepaticoides albescens, foliis pinnatis. VAILLANT, *Bot. Par.* p. 100. t. 19. f. 5.

Lichenastrum auriculatum, pinnulis angustis, planis, recurvis. DILL. *Musc.* t. 71. f. 20.

Lichenastrum foliis variis. DILL. *Musc.* t. 73. f. 36.

β. PROCUMBENS; caule procumbente, foliis erectiusculis.

HAB. Abundant in England, Scotland, and Ireland, in various situations, though generally preferring a loamy soil in hedge-banks.—β was found in Scotland, by Mr. Dickson, upon a stiff clayey soil.

(*J. albicans.*)

BRITISH JUNGERMANNIÆ.

OBS. Fructification, both male and female, is produced plentifully in the spring and early summer months, if the weather prove moist. Gemmiferous plants are equally common throughout the summer.

PLANT, for the most part growing in large and densely-crowded tufts, covering a surface of ground six or seven inches in diameter; at other times shooting up among Mosses, and various species of Jungermanniæ, in a more loose and straggling manner.

The *Roots*, in general, originate from the lower part of the plant, and consist of minute fibrous, pellucid, simple radicles.

Stems erect, from an inch to an inch and a half or two inches in length, simple, or once or twice divided in a dichotomous manner, and often producing innovations; they are flexuose and filiform, of a pale yellowish-brown color, approaching to a red.

Leaves bifarious and distichous, more or less closely placed, in their lower part amplexicaul and slightly decurrent, divided from the extremity to within one third of the base, into two unequally-sized, conduplicate, appressed, vertical lobes, of which the inferior is the largest, and is half a line or more in length, oblong, acute, plane, and a little curved on one side, so as to be somewhat scymitar-shaped; the superior lobe, or lobule, differs from the one just described, in being only about half its size, and of an oblongo-ovate figure, acute, and by no means scymitar-shaped: it is closely appressed, in a diagonal direction, to the inner side of the larger lobe; both are serrated at the point, though the lobule is so in a slighter degree than the lobe. The *texture* of the leaf is of two kinds, the greater part being composed of ovate cellules, forming a very evident, though minute, sort of reticulation; whilst from the central base arises a pellucid mark, which, branching off at the division of the leaf, forms the letter V (f. 9), and disappears a little below the point of the lobes. In this mark the cellules are seen to be extremely narrow, cylindrical tubes, very much longer than those of the circumference of the leaf. The *color* is sometimes a deep, but more frequently a pale, yellowish green, with a brownish tinge in those leaves which are nearest the extremity of the plant, and which thus appear as if scorched with heat. When dry the *color* is universally paler, and after having been long kept in the herbarium, becomes almost white.

Perigonial leaves (f. 10) more crowded than the rest, and situated upon a swollen part of the stem (f. 6): they resemble the cauline leaves, except in having a ventricose base, where the anthers are placed, and the apex is not unfrequently much recurved.

The *Perichætal leaves* are large, and with their base entirely sheath the lower part of the calyx; their lobes, too, are recurved at the apices.

MALE FRUCTIFICATION (f. f. 6. 10. 11) I have seen upon the same plant with the female, as well as upon different individuals. The *anthers* are placed in clusters of three or four in the axillæ of each perigonial leaf, and are ovate approaching to round, strongly reticulated in the older ones, whilst in the younger anthers this appearance is scarcely perceptible: their *color* is an olive-green before the emission of the pollen, afterwards white and pellucid. The footstalks are about the length of the anther, white, jointed.

BRITISH JUNGERMANNIÆ.

(*J. albicans.*)

FEMALE FRUCTIFICATION terminal.

Calyx a line in length, ovate, rather attenuated at the base, towards the extremity longitudinally plicate; the *mouth* contracted and toothed. The *reticulation* is throughout formed of minute, somewhat ovate, cellules: the *color* is a yellowish green.

Calyptra ovate, reticulated, whitish, tipped with a short hollow *style*, and surrounded at the base by a few short *barren pistilla*, which are a little swollen below, and are, throughout, both longitudinally and transversely marked with darker lines.

Peduncle three quarters of an inch in length, white, pellucid, shining, cellulose.

Capsule ovate, reddish-brown.

Seeds spherical; *spiral filaments* composed of a double *helix*: both of a fulvous color.

The *Var. β.* grows in distant and straggling patches; the *stems*, instead of being erect, as is usual with the plant, are procumbent, and throw out a few radicles here and there from nearly the whole length of their under side.

The *Leaves* are nearly erect, and the whole plant is of a dull, yellowish-red color.

Gemmæ are produced upon the extremity of the terminal leaves, there lying in small scattered clusters, which are very soon dispersed. Each particle is somewhat spherical, with many acute projections or angles, of a pale yellow color and semi-transparent.



Of the *Jungermannia exstipulatæ*, which have their leaves divided into two unequal and conduplicate lobes, four species * have been already described, according in general habit, as well as in the peculiar shape of the calyx, which is compressed, incurved, and truncate at the extremity. There is still another small family of the "*Jungermannia exstipulatæ, foliis inæqualiter bilobis*," which, though corresponding in many respects with the species just alluded to, nevertheless are found to differ from them essentially in the figure of the calyx: for in these it is cylindrical, erect, and plicate, and its mouth is contracted and dentated. Of such, I can mention, with certainty, one species alone, the subject of the present description, which has fallen under the observation of preceding writers: but two others, which I have named *J. obtusifolia* and *J. Dicksoni*, have lately been added to the British list, and will soon make their appearance in this work. From them, *J. albicans* may be readily enough distinguished, by its much larger size, as well as by two marks still more decisive; one of which is to be found in the serratures of the leaves; the other in the pellucid, forked nerve, which, originating in the base of the leaf, occupies the centre of both lobes, and vanishes a little below their points. The difference in the shape and size of the cellules, which is the cause of this appearance, is, as far as I have had the opportunity of observing, peculiar to this species of the genus, and, although very evident, and observable even with the naked eye, it has not, that I am aware, been noticed by any author, except Weis, who well remarks of the leaves, that "*per lentem nervo quasi divisa sunt et serrulata.*"

A celebrated French Botanist, M. Palisot Beauvois, has not only endeavored to controvert the Hedwigian system with regard to the sexual organs in mosses, but in the order *Hepaticæ*,

* *J. nemorosa*, *J. undulata*, *J. resupinata*, and *J. umbrosa*.

(*J. albicans*.)

BRITISH JUNGERMANNIÆ.

likewise, opposes the theory of the same eminent Naturalist. Strange, however, as it may appear, those very organs* (the anthers of Hedwig), which, in the mosses, he considers merely as "simples bourgeons semblables à ceux que l'on trouve dans quelques Liliacées, la Bistorte †" &c., and as distinct from the essential organs of fecundation; in the *Jungermanniæ* he raises to the rank of fruit and capsules. To these, he alludes, when he says "Je donnerai sous peu à l'Institut la preuve que les Jungermannes ont un fruit et une capsule bien prononcée, et différente de la petite fleurette qui se divise en croix et qui contient une poussière adhérente à des filamens irritables ‡." Proceeding upon these grounds; considering the male fructification as the female, and the female as the male, he has formed, in his splendid work, *the Flora of Oware and Benin*, a new genus of these *Jungermanniæ*, called by Micheli "Muscoides §," to which he has applied the name *Carpolepedium*, and proposes that it should comprehend, besides some new exotic species and the *C. dichotomum* of his work, *J. albicans*. But, in the character which he has given of the genus, there is nothing to distinguish it from all the rest of the "*Jungermanniæ foliis bilobis, conduplicatis*," except in that part of it, where he describes what he calls the capsule or fruit (our anther); and this, he says, is "ovatus aut globosus, brevissimè pedunculatus, acumine parvo, styloformi, acuminatus." This styloform point, however, has no existence in the anthers of any of the British species of his genus. With the *Carpolepedium dichotomum* I am unacquainted. In its foliage, according to M. Beauvois' figure, it bears a considerable resemblance to *Jung. asplenioides*, whose anthers are likewise destitute of any point.

The Dillenian plant, t. 73. f. 36. of the *Hist. Musc.* (*J. varia* LINN.), differs in no respect from the species represented at t. 71. f. 20. of the same work (*J. albicans*, L.), although every author has followed Dillenius in keeping them distinct. Nor do any of the descriptions of *J. varia* of subsequent Floras so ill accord with our plant, as to induce me to exclude them from the above synonyms. That of Michaux, however, cannot be quoted without a mark of interrogation, since he says that the divisions of the leaves are of an equal size.

Micheli's figure and description are extremely imperfect, and, according to the character that is given of the leaves, seem rather to belong to *J. emarginata*, than to *albicans*; but the calyx is widely different. Roth, indeed, quotes this figure to his *J. compacta*, a species, which, by means of authentic specimens, that I have lately received from Dr. Swartz, I am enabled to say is nothing more than *J. resupinata* of this Monograph. To that plant, therefore, the following synonym may be added; *Jungermannia compacta*, ROTH, *Germ.* III. p. 375.

* I cannot here omit offering it as my opinion, that those who will give themselves the trouble of examining the Hedwigian Anthers of the *Jungermanniæ*, such as are represented in the "*Theoria*" upon *J. asplenioides* and *J. pusilla*, and will compare their structure with that of the anthers in mosses, will be led to conclude, that, whatever doubts may have arisen respecting the sexes of these parts, they are, nevertheless, destined in both to perform similar functions. In each they are composed of an exterior, reticulated, and almost colorless membrane, which envelops an extremely minute, granulated substance, and at length opens at the extremity for the discharge of these granules. In both, too, they are situated upon a footstalk. Their figure, in the mosses, is, for the most part, oblong: an exception, however, offers itself in the genus *Sphagnum*, where their form is ovate or spherical, as in the *Jungermanniæ*. Nor are the anthers of these plants of such rare occurrence or so difficult to be discovered, as the remarks of M. Beauvois would lead us to suppose; since, by the communications of my friends and my own investigation, I am already in possession of the male fructification of the greater number of the British species. For their detection, indeed, I must acknowledge that the use of the microscope is often indispensable, and Botanists must calculate on meeting with disappointments in their researches, who join M. Beauvois in observing "que ce système microscopique, qui ne peut s'appliquer à toutes les mousses, a l'erreur pour base."

† *Prodrome des cinquième et sixième Familles de l'Æthérogamie*, p. 8.

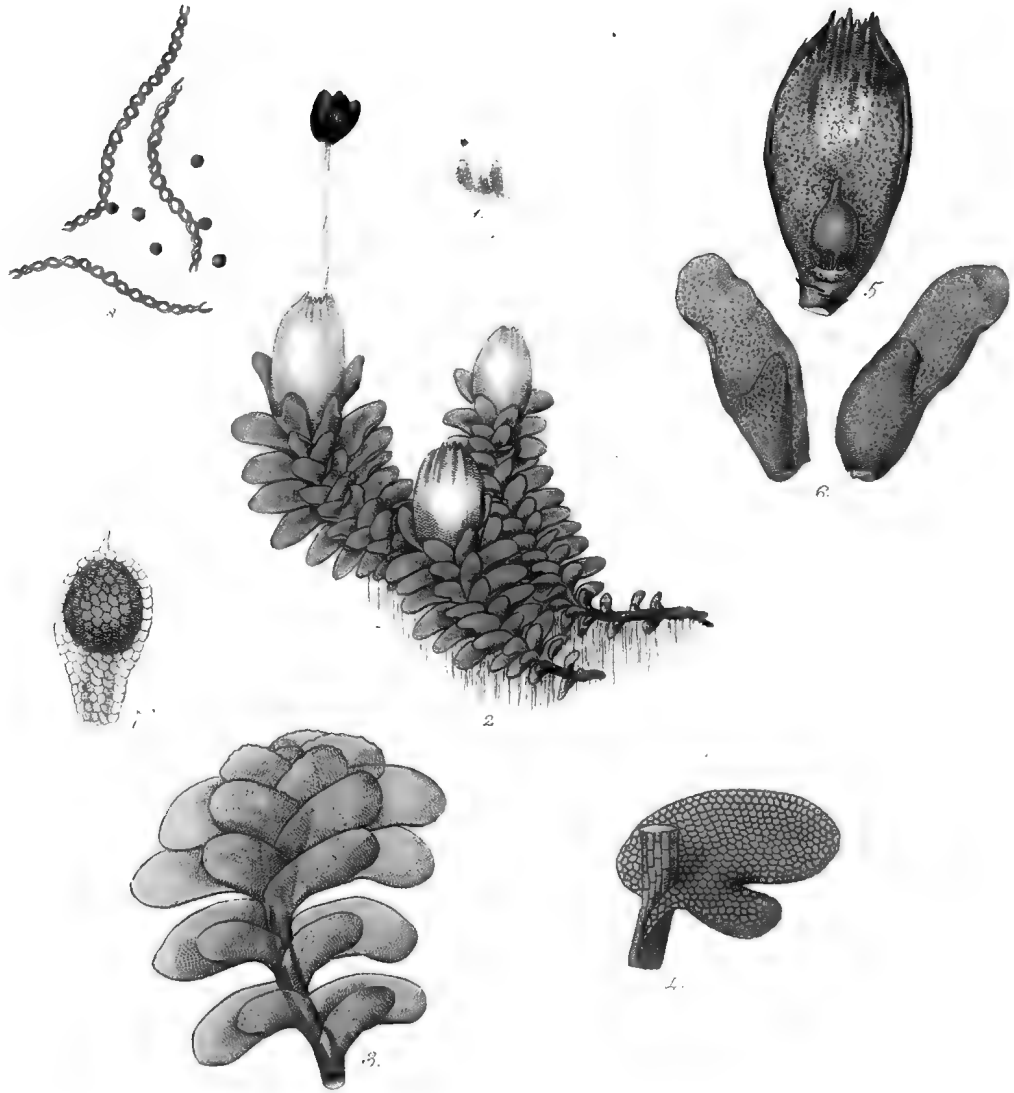
‡ *Flore d'Oware et de Benin*, p. 9. Note.

§ Containing *J. platyphylla*, *J. Tamarisci*, and *J. dilatata*.

REFERENCES TO THE PLATE.

FIG.

1.	Male plants of <i>J. albicans</i> , natural size.	
2.	Female plants, natural size.	
3.	Sterile plants, natural size.	
4.	β of <i>J. albicans</i> , natural size.	
5.	β magnified	6
6.	Extremity of a male plant, having young shoots	6
7.	} Leaves	4
8.		
9.	Leaf with the upper lobe, or lobule, expanded to shew the nerve	4
10.	Perigonial leaf	4
11.	Young anthers	1
12.	An old anther	1
13.	Female plant	6
14.	Calyx, longitudinally dissected	5
15.	Interior view of a perichætial leaf	4
16.	Exterior view of a perichætial leaf	4
17.	Calyptra and barren pistilla	3
18.	Barren pistilla	2
19.	Barren pistillum	1
20.	Seeds and spiral filaments	1



Jungermannia obtusifolia.
Distichium obtusifolium (Hook) Dum.

JUNGERMANNIA OBTUSIFOLIA.

(TAB. XXVI.)

JUNGERMANNIA, caule ascendente, simplice: foliis bifariis, inæqualitèr bilobis; lobis conduplicatis, obtusis, integerrimis; inferioribus majoribus, subacinaciformibus; superioribus ovatis: fructu terminali; calycibus obovatis, ore contracto dentato.

Jungermannia foliis pinnatis, ovatis, confertis, ex apice floriferis. HALL. *Helv.* IV. p. 61 ?
(*exclusis synonymis.*)

HAB. Near Heddon on the Wall, Northumberland. *Mr. Thornhill*.—Very rare in Ireland, where *Miss Hutchins* has discovered it only in one spot, near Bantry.

OBS. It bears fructification in March and April.

PLANT growing in densely-matted tufts, two or three inches in diameter, firmly attached to the soil, by means of their numerous, thick

Roots, which consist of simple, pellucid fibres, and issue most copiously from every part of the

Stems: these are ascending, or, when much crowded, nearly erect, seldom exceeding three or four lines in length, simple, though there is often an appearance of their being branched, from young shoots, which are not unfrequently produced towards the extremity of the plant: the *color* is a dirty green, more or less approaching to a pale brown.

Leaves bifarious, distichous, and horizontal, rather closely imbricated, so much so, as entirely to conceal the stem; they are smallest at the base, larger and more crowded at the apex, particularly of the sterile plant, from a quarter to half a line long, somewhat of a roundish figure (supposing the leaf to be expanded, f. 4.), divided about half way down, from the extremity, into two, unequal, conduplicate, vertical lobes, of which the inferior is the largest, oblong, and a little curved on one side, so as to be scimitar-shaped; the superior, or lobule, is ovate, or oblongo-ovate, in the upper ones, and is closely appressed, in a diagonal direction, to the larger portion of the leaf; both are remarkably obtuse at their apices and rounded, their margins every where entire, except, indeed, in a few of the terminal leaves, which, under a high power of the microscope,

(*J. obtusifolia*.)

BRITISH JUNGERMANNIÆ.

may be seen to be obscurely crenate. The *reticulation* is small, formed by roundish cellules of nearly the same size throughout: the *color* of the leaves a pale green, becoming still paler after having been kept for some time in the Herbarium.

Perigonal leaves very closely imbricated, and placed at the extremity of the plant, much inflated at the base; at their apices, both in the lobes and lobules, recurved.

Perichæatial leaves (f. 6) larger than the rest, and more erect, a little waved at their margins; with their almost cylindrical base, they entirely envelop the lower part of the calyx.

MALE FRUCTIFICATION always, as far as my observation enables me to judge, upon distinct plants from those which produce the female. The *anthers* are situated in small clusters in the axillæ of the perigonal leaves, and upon short white footstalks. They resemble, in every respect, those of *J. albicans*.

FEMALE FRUCTIFICATION constantly, in reality, terminal, though the shoots or innovations, before alluded to, as originating not unfrequently from the extremity of the stem, often take their rise immediately below a calyx, and thence make it seem lateral.

Calyx (f. 5) ovate, or rather obovate, erect, plicate in its upper half; the *mouth* contracted, and cut into several small, sharp teeth. In *color* and *texture* the calyx resembles the leaves, except that, in a more advanced state, it is white and scariose at the orifice.

Calyptra obovate, whitish, strongly reticulated, so transparent that the young capsule and its peduncle may very distinctly be seen within it (f. 7). *Style* short and tubular.

Barren pistilla seven or eight in number, linear, faintly striated both longitudinally and transversely.

Peduncle two or three lines long, white, shining, succulent, cellulose.

Capsule ovate, approaching to round, of a deep reddish-brown *color*: it divides into four equal, ovate, and obtuse valves, and discharges its numerous

Seeds and *spiral filaments* (f. 8) of a fulvous color, the former spherical, the latter composed of a double *helix*.

I cannot quote the Hallerian synonym, above alluded to, without entertaining considerable doubts as to the propriety of my doing so; since the description is of such a nature, that little can be collected from it to aid our conjectures, and the references given by the author all belong to quite a different plant. Haller, indeed, observes, that the leaves are "*paulum auriculata*," and further says of his species, "*ad Jungermanniam DILL. 20. (J. albicans) proximè accedit, sed foliis differt rotundioribus.*"

The entire margins of the leaf in *J. obtusifolia* (or, at most, their being only very slightly crenated in a few that are situated at the extreme part of the stem), the want of the pellucid central mark, and the diminutive size of the whole plant, will always distinguish it from *J. albicans*, as will the obtuse and rounded ends of the lobes from *J. Dicksoni*.

BRITISH JUNGERMANNIÆ.

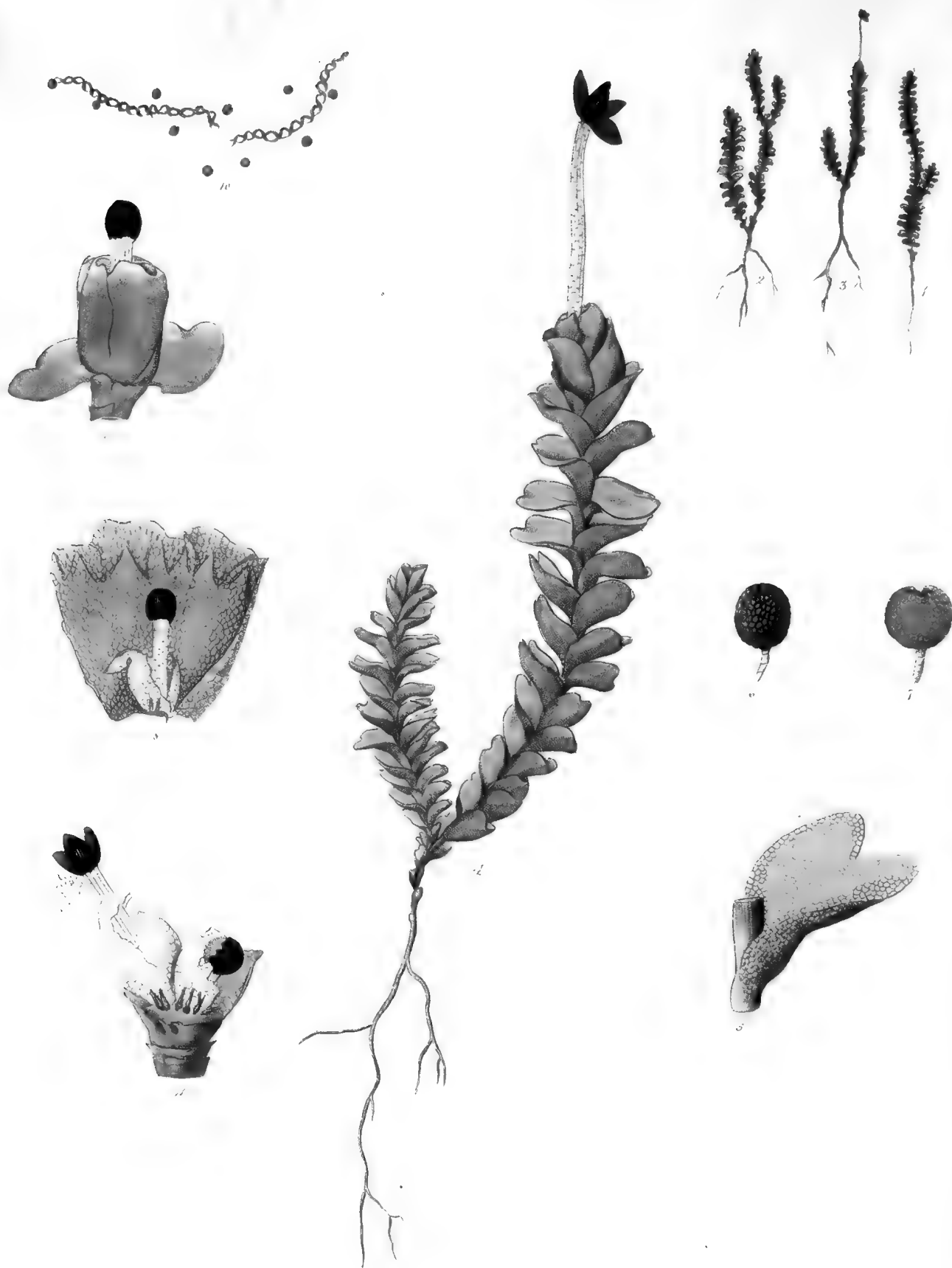
(*J. obtusifolia*.)

We owe the discovery of this plant to Mr. Thornhill, of Gateshead, near Newcastle, who found it in 1805. Miss Hutchins has since met with it in Ireland, in greater plenty and perfection; yet, even here, it is confined to one spot. The male and female fructification are neither of them of rare occurrence, though I was not so fortunate as to be acquainted with the former, before the engraver had finished the plate. The individuals producing anthers are rendered conspicuous by their swollen apices. Calyces seem to be abundant throughout the year, and it appears that they remain upon the plant long after the peduncle and capsule have decayed.

REFERENCES TO THE PLATE.

FIG.

1.	<i>J. obtusifolia</i> , female plants, natural size	
2.	The same, magnified	6
3.	Extremity of a sterile stem	4
4.	Leaf, with the lobes expanded	3
5.	Calyx	3
6.	Perichæatial leaves	3
7.	Calyptra, enclosing the young capsule	2
8.	Seeds and spiral filaments	1



Jungermannia emarginata.
Lysipelta emarginata (Ehrh.) Sw.

JUNGERMANNIA EMARGINATA.

(TAB. XXVII.)

JUNGERMANNIA, caule erecto, ramoso: foliis bifariis, laxè imbricatis, patentibus, obcordatis, emarginatis: fructu terminali; calycibus ovatis, perichætio immersis.

Jungermannia emarginata. EHRHART, *Beitr.* Band. III. p. 80. SCHRADER, *Samml.* II. p. 4. SCHRADER, *Spic. Fl. Germ.* p. 75. HOFFMANN, *Germ.* II. p. 82. ROTH, *Germ.* III. p. 367. *Engl. Bot.* t. 1022. LINN. *Syst. Nat. ed. Gmel.* II. p. 1348.

Jungermannia macrorhiza. DICKSON, *Crypt. Fasc.* II. p. 16. t. 5. f. 10. LINN. *Syst. Nat. ed. Gmel.* II. p. 1349. WITH. III. p. 854.

HAB. Plentiful in the alpine districts of England, Scotland, and Ireland, delighting in very wet places; even in the waters of rapid torrents, and in situations where it is continually exposed to the spray of a water-fall. It bears fructification in the early months of summer.

PLANT growing in large patches, more or less densely crowded.

Roots proceeding almost entirely from the lower and leafless part of the stems, from half to three-quarters of an inch long, nearly as thick as human hair, rigid, often branched.

Stems from one to three, or even four inches long, filiform, or increasing somewhat in size towards the extremity, erect, sometimes simple, but more frequently once or twice bifid, with segments of uncertain length, and, besides, producing innovations, which are either lateral, or originate, in clusters of three or four, from the bosom of the terminal leaves: their *texture* is somewhat ligneous; when dry, very brittle.

Leaves from a quarter to half a line long, at the base of the plant almost always much decayed, but more perfect, and of a larger size, towards the centre of the stem: they are bifarious and distichous, loosely imbricated, patent or erecto-patent, nearly obcordate (f. 5), semiamplexicaul at their base; the lateral margins, especially that part of them which is nearest the stem, much incurved, the apex divided, by a rather deep and acute notch, into two very obtuse rounded segments: the *texture* rather firm; the *cellules* extremely minute, roundish: the *color* exceedingly variable in different situations; in less moist, but more exposed places, it is generally of a deep brownish purple hue; when found in rivulets, as Dr. Smith well observes, it loses its purple tints and becomes dark green.

(*J. emarginata.*)

BRITISH JUNGERMANNIÆ.

The *perigonial leaves* differ in no respect from the rest, except in having a *ventricose* base.

Perichætical leaves attached to the exterior surface of the calyx on which they grow, and surround it on all sides, so as entirely to conceal it: they are erect and smaller than the cauline leaves, but, in other respects, much resembling them; the inner ones, however, are less deeply emarginate.

MALE FRUCTIFICATION situated in the axillæ of the perigonial leaves, and mostly near the extremity of the stem. *Anthers* (f. f. 6. 7) spherical, reticulated; before the discharge of the pollen of a pale dirty-green, afterwards a yellow-brown. 'The *footstalk* about the length of the anther, white and transversely striated.

FEMALE FRUCTIFICATION terminal.

Calyx (f. 8) ovate, immersed in the perichætical leaves, of a thick carnose substance, in consequence of the united bases of these leaves; the *mouth* alone free and membranous, and, as may be seen by a careful section of the calyx and its covering, cut into six or eight rather large teeth, two of which, I have, in several instances, observed to arise from a larger interior appendage, somewhat resembling a leaf, but much narrower, plane, and scarcely emarginate at the extremity.

Calyptra ovate, whitish, delicate, reticulated, surrounded at the base by a few *abortive pistilla*.

Peduncle seldom exceeding half an inch in length, white, shining, transversely and longitudinally striated, terminated by a roundish

Capsule of a brown color, furrowed on its exterior surface, and opening into four equal ovate valves.

Seeds (f. 10) spherical, fulvous, accompanied with *spiral filaments* of the same color, composed of a double *helix*.

It is remarked by Dr. Smith, in *English Botany*, upon the authority of the Linnæan Herbarium, that this species was first found and named by Dr. Swartz, many years before it was published by Ehrhart. The same eminent Swedish Naturalist, who has sent me many specimens, has, farther, looked upon the luxuriant and dark green appearance of this plant as a distinct variety, and in his manuscript has named it β *aquatica* *. Yet, notwithstanding such high authority, I find intermediate states of the plant so common, and the gradations between them so imperceptible, arising solely from the greater or less degree of moisture with which they are supplied, that I am induced rather to include the β of Swartz in my general description, than follow his example in separating it. The name given to this species by our countryman, Mr. Dickson, who published it as new in his second fasciculus, is so expressive of one of the most obvious of its characters, that there is much reason to regret the necessity of laying it aside.

* Dr. Schrader also describes what he considers a singular variety, found by him in the Hercynian Forest, in the following terms: "Hujus insignis varietas in Hercyniæ rivulorum saxis provenit, quæ surculis fluitantibus, ramosioribus, ab unciali ad biuncialem longitudinem protensis, et foliis laxioribus atro viridibus distinguitur." *Spic. Fl. Germ.* p. 75.

Dr. Schrader mentions having seen capsules occasionally lateral, which Dr. Roth attributes to innovations of the stem, an opinion in which I am the more inclined to coincide, since I have at this moment, before me, a specimen from Mr. Lyell, which has young fructification, and, immediately below the calyx, a cluster of three or four young shoots, arising from the axilla of a leaf. These would, in the course of a little time, have given such an appearance of a continuation of the stem, that the fructification might, without a careful inspection, have been supposed to be lateral. The same author also describes the stems as really simple, and merely taking the appearance of being branched from their annual innovations, in which he is also probably right.

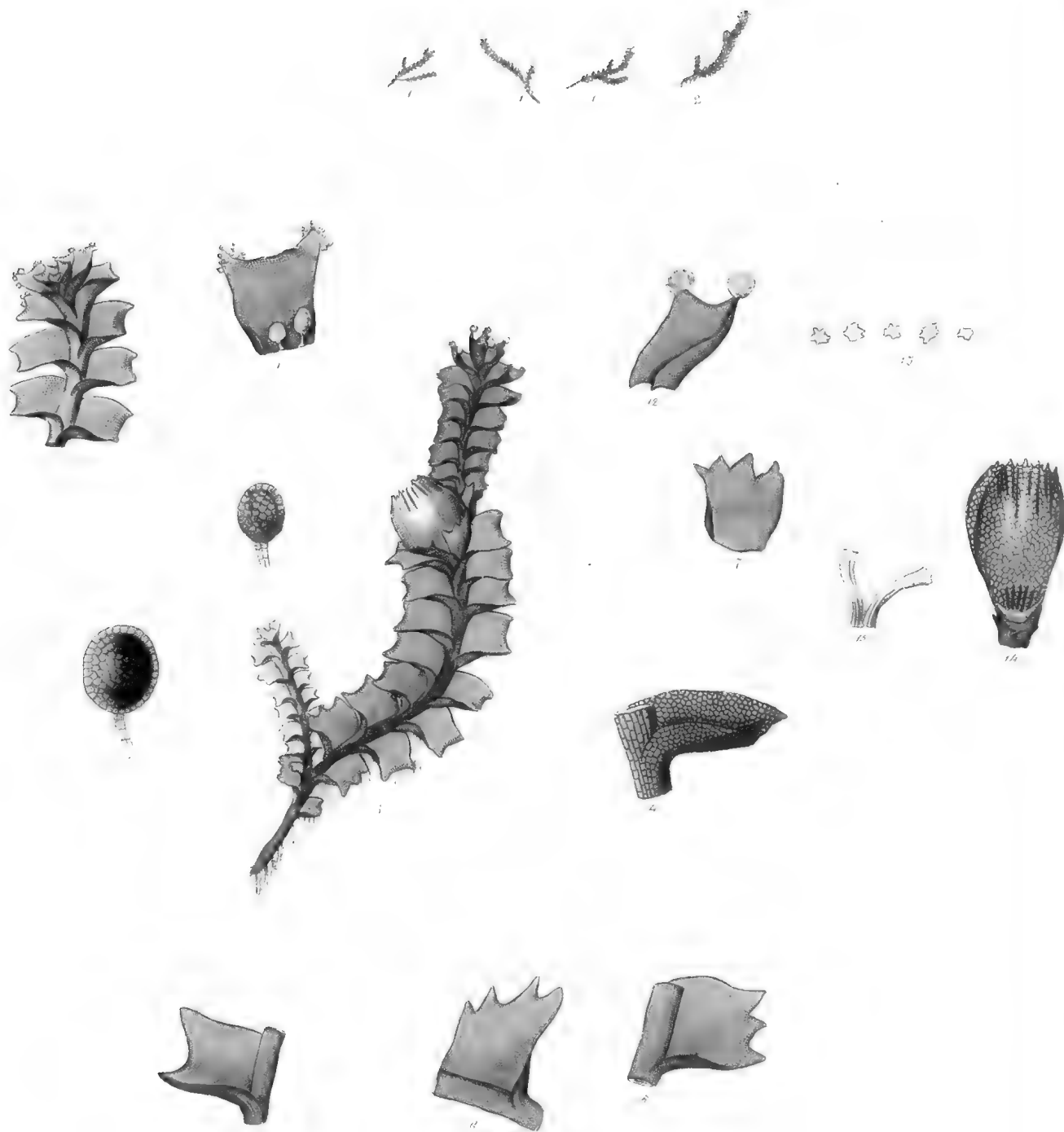
Besides the singularly large and branching roots, already noticed, of *J. emarginata*, the shape of the leaves (which Ehrhart aptly compares to a heart cut out of paper), and the immersed calyces, afford characters so decisive, that this may be considered as a species the most distinct of any in the genus. In general habit, indeed, and somewhat in the shape of its leaves, it has an affinity with *J. concinnata*, but so slight a one, that it will be needless for me to enlarge more upon the subject.

In August, 1808, Mr. Borrer and myself found, upon the summit of Ben Nevis, small specimens of this plant, whose calyces contained two, and sometimes three, fertile germens, and, what was more remarkable, capsules of very diminutive size, situated upon peduncles so short that they were not equal to the length of the calyx; yet these capsules were fully formed, and some of them were even discharging their seeds and filaments whilst under the microscope. This appearance is represented at f. 11.

REFERENCES TO THE PLATE.

FIG.

- | | | |
|-----|--------------------------------------------------------------------------|---|
| 1. | Male plant of <i>J. emarginata</i> , natural size. | |
| 2. | Sterile plant, natural size. | |
| 3. | Female plant, natural size. | |
| 4. | The same, magnified | 6 |
| 5. | Leaf | 4 |
| 6. | Perfect anther | 1 |
| 7. | Anther, after it has discharged its pollen | 1 |
| 8. | Interior of a calyx | 4 |
| 9. | Calyx and perichæatial leaf | 5 |
| 10. | Seeds and spiral filaments | 1 |
| 11. | Receptacle, with the calyx torn away to exhibit the small capsules | 3 |



Jangermannia ventricosa
Scabozia ventricosa (Dicks) Dum.

JUNGERMANNIA VENTRICOSA.

(TAB. XXVIII.)

JUNGERMANNIA, caule prostrato, subramoso: foliis patentibus, subquadratis, obtusè emarginatis, lateribus incurvis: fructu terminali; calycibus subsphæricis, demùm oblongo-ovatis; ore contracto, plicato, dentato.

Jungermannia ventricosa. DICKS. *Plant. Crypt. Fasc. II. p. 14.* WITH. p. 856. LINN. *Syst. Nat. ed. Gmel. II. p. 1349.*

Jungermannia bidentata. γ. *globulifera.* WEBER, *Spic. Fl. Goet. p. 134.*

Jungermannia bidentata. SCHMIDEL, *Diss. Jung. p. 106. f. XIV.*

Jungermannia globulifera. POLLICH, *Pal. III. p. 182?* TIMM. *Prodr. Floræ Megap. n. 865.*

(fide ROTHII). ROTH, *Germ. III. p. 379.*

Jungermannia bicornis. HOFFMANN, *Germ. II. p. 89. Fl. Dan. t. 888. b. (non. a.)*

Minum fissum. NECK. *Meth. Musc. p. 237.*

Jungermannia minor, repens, foliis subrotundis, bifidis, vaginâ florum cylindraceâ. MICHELI, *Nov. Gen. p. 8. t. 5. f. 13.*

Jungermannia minima, repens, foliis bifidis, vaginâ florum ventricosâ. MICHELI, *Nov. Gen. p. 9. t. 5. f. 15.*

Lichenastrum, quod Jungermannia minima, repens, foliis bifidis, vaginâ florum ventricosâ. DILL. *Musc. t. 70. f. 14.*

Jungermannia foliis imbricatis, bicuspidatis, globuliferis. HALL. *Helv. III. p. 59.*

HAB. In woods. *Mr. Dickson.*—Not uncommon in various parts of the kingdom. (The *Rev. Mr. Francis* has, for many years, noticed it in the neighborhood of his residence, attached both to a boggy and loamy soil, in Holt wood and Lows, as well as in Edgefield wood, and on the heath: growing also among *Sphagnum*.)

Miss Hutchins has discovered fructification, in the month of November, about Bantry, where it continues in fruit but for a few days. *Dr. Taylor* finds it upon Boulacross mountain, with capsules, in May; and *Mr. Mackay*, at the same time, near Dublin, with calyces, in which state, indeed, it is not uncommon, during most of the spring months.

In the early part of summer, principally, the *Gemmæ* are produced; though *Mr. Lyell* finds them in great perfection in the month of August, and even in the beginning of September.

(*J. ventricosa*.)

BRITISH JUNGERMANNIÆ.

PLANT growing sometimes in densely-matted patches, at other times singly, creeping among *Sphagnum latifolium* and *capillifolium*, or *Dicranum glaucum*.

Root consisting of rather thickly-placed, whitish, simple fibres, shooting out from nearly the whole length of the under side of the plant.

Stems from half to three quarters of an inch in length, and the tenth of a line in diameter, procumbent, flexuose, rarely simple, more frequently once or twice branched, with the branches having the appearance of being again divided, in consequence of the innovations: they are of a green color, sometimes approaching to a brownish-black, and I have lately received specimens from Mr. Lyell, in which both the stems and roots have a deep purple tinge.

Leaves rather closely placed, though scarcely imbricated, bifarious, distichous, patent, or even occasionally deflexo-patent, with the lateral margins always more or less incurved (f. 4), about a quarter of a line in length, of a subquadrate figure, divided at the extremity by a wide and obtuse notch, of which the points or segments are acute, and, in the extreme leaves, sometimes involute; the lower ones, it is to be remarked, are cleft into three (f. 5), or, which is more rare, four teeth (f. 6) or segments, which are frequently of unequal sizes: the texture is rather delicate, the cellules small, roundish; the color a pale green, assuming more or less of a brownish tint, in much exposed situations.

The perigonial leaves do not differ from the rest (f. 9).

Perichæial leaves (f. 7) closely embracing the calyx, cut at their extremity into three, four, and even five acute, and large, but unequally-sized teeth.

MALE FRUCTIFICATION. *Anthers* (f. f. 9. 10. 11) situated, two or three together, in the axillæ of the terminal leaves. Hitherto I have only observed them on distinct individuals from those which bear female fructification. The form of each *anther* is ovate, or rotundo-ovate: the older ones are of a greenish ash-color, and strongly reticulated. The *footstalk* is about half the length of the anther, white, and marked with transverse lines.

FEMALE FRUCTIFICATION terminal, though very frequently, as is represented in the plate, it has the appearance of being lateral (f. 3), from young shoots*, which arise immediately beneath it.

The *calyx* is remarkable for being in its early state of a spherical figure (f. 3), and I was unfortunately not acquainted with the fructification in a more advanced period of its growth, till a long time after the plate was engraved. By specimens, however, which I have lately received, I am enabled to add that the calyx, at the time it produces capsules, is oblongo-ovate; at all times plicate towards the extremity. The *mouth* is contracted and minutely toothed.

Calyptra ovate, whitish, tipped with its tubular style.

Barren pistilla (f. f. 14. 15) six or seven in number, linear, of a greyish color, longitudinally marked with reddish lines, their apex a little expanded.

Peduncle from a quarter to half an inch long, white, shining, transversely and longitudinally striated.

* Probably Micheli was deceived by this circumstance. His figure, however, gives the idea of the calyx being sessile, in the centre of a plant that is branched in a stellated manner; which is not the case in any species that I am acquainted with.

BRITISH JUNGERMANNIÆ.

(*J. ventricosa*.)

Capsule ovate, deep brown, furrowed.

Seeds and *spiral filaments* of a fulvous brown color; the former exactly spherical, the latter composed of a double *helix*.

Obs. The spherical clusters of *gemmæ* (f. 12), which form one of the most striking features of this species, are situated at the points of the terminal leaves, both of the main branches and of the young shoots; they are, when perfect, so compact as to resemble little pale yellow-green balls; when scattered about, however, they are found to be composed of extremely minute, angular, pellucid granules (f. 13).

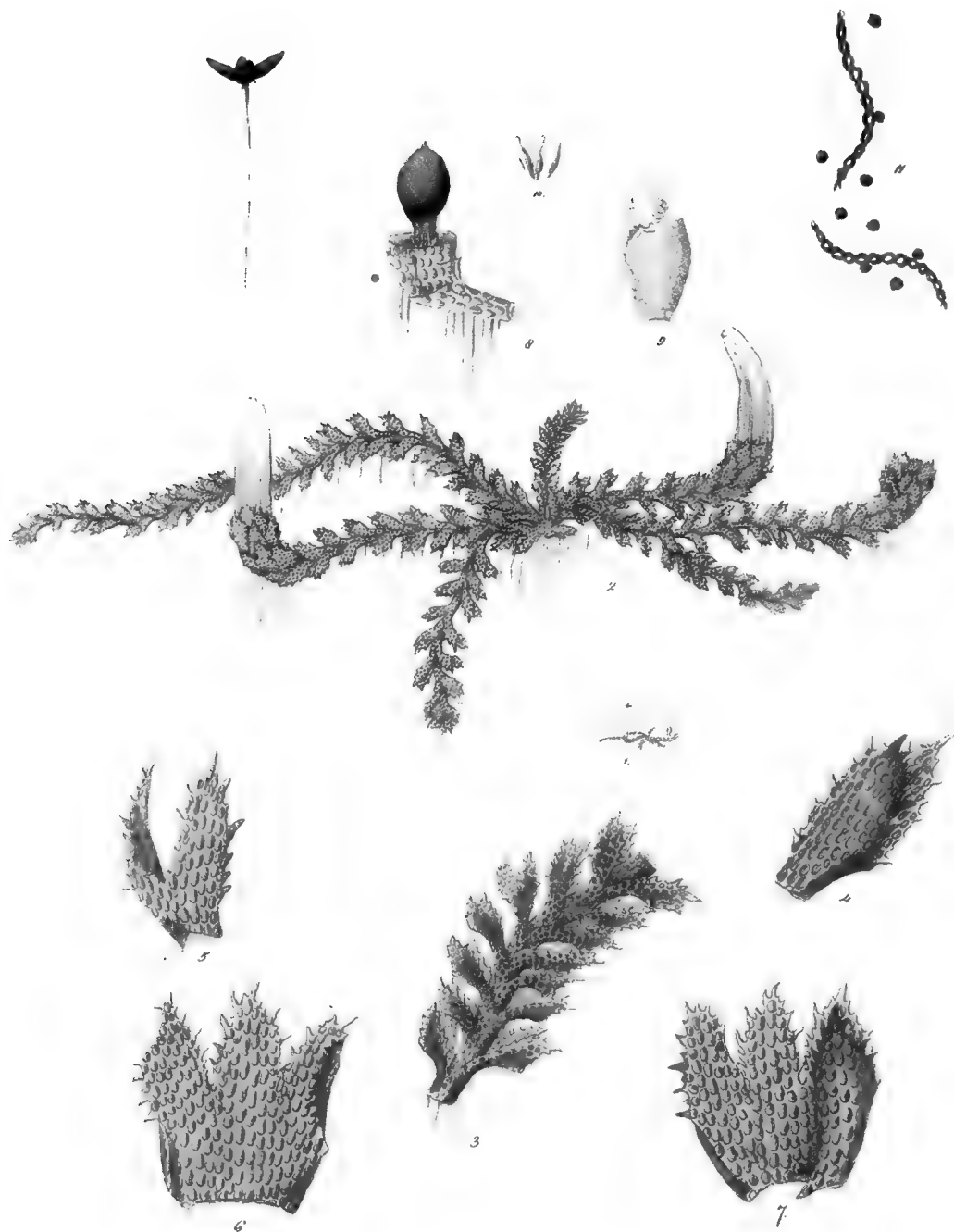
Few *Jungermanniæ* seem to be less understood than the present species, which, indeed, is not much to be wondered at, when we consider the close affinity it bears with *J. excisa*; from which it may be distinguished by its larger size, more branched habit, the involute margins of the leaves, and the abundant and very conspicuous gemmaceous globules. Of this species the capsules are extremely rare, though calyces are frequently to be met with, which, like the sterile calyces of *J. inflata*, fall from the plant with a very slight touch.

Mr. Dickson first discovered this species in Britain, and ascertained it to be the "*Jungermannia minima, repens, foliis bifidis, vaginâ florum ventricosâ*" of Micheli; and it appears to me that the "*Jungermannia minor, repens, foliis subrotundis, bifidis, vaginâ florum cylindraceâ*," of the same author, may be referred to with equal propriety. With regard to the figures, they cannot certainly be considered as accurate representations of the plant; and what Micheli says of f. 15, applies also, to f. 13, "*Ipsa planta duplè minor est quàm exprimit Icon.*" The *gemmæ* are particularly ill done, and seem to indicate that the clusters are supported by a footstalk. Dillenius has done no more than copy the Michelian figure and description. Roth, under his *J. globulifera*, has, as it appears to me, and as I have already had occasion to mention, described three species; the present, *J. exsecta*, and *J. excisa*. Pollich's plant above quoted, ought, perhaps, rather to be referred to under this species, than under *J. bicuspidata*, where I have also quoted it, though in both instances with a mark of interrogation. I have inserted Timme's *J. globulifera*, as a synonym, solely upon the authority of Roth. The plant of Haller can hardly be doubted, especially as he quotes f. xiv. of the *Diss. Jung.* of Schmidel, which I think may with equal certainty be said to belong to *J. ventricosa*. The excellent writer last mentioned has, nevertheless, confounded it with *J. bidentata*, and Weber has made it his *var. γ*, of the same species. Haller and Weber say that they have observed the globules of the *gemmæ* to be confined to one point of the leaf, whilst Necker very justly remarks, that they are common to both.

REFERENCES TO THE PLATE.

FIG.

1.	Male plants of <i>J. ventricosa</i> , natural size.	
2.	Female plant, natural size.	
3.	Female plant, magnified	6
4.	Leaves	4 and 3
5.	} Lower leaves	4
6.		
7.	Perichætal leaf	4
8.	Portion of a male plant, with gemmæ	6
9.	Perigonial leaf and anthers	4
10.	Small anther	1
11.	Anther arrived at its full size	1
12.	Terminal leaf with gemmaceous balls	4
13.	Particles of the gemmæ	1
14.	Calyx, longitudinally dissected	3
15.	Barren pistilla	1



Jungermannia Turneri.
Cephaloziella Turneri (Hook.) K. Moll.

JUNGERMANNIA TURNERI.

(TAB. XXIX.)

JUNGERMANNIA, surculo procumbente, flexuoso, stellatim ramoso: foliis latè ovatis, acutè bipartitis; segmentis subconduplicatis, spinuloso-dentatis: fructu terminali; calycibus lineari-oblongis, longitudinalitèr plicatis; ore denticulato.

HAB. Shady bank of a mountain-rivulet near Bantry. *Miss Hutchins.*—(It bears fruit most plentifully about the beginning of March.)

This rare PLANT is found growing in small, pale, yellow-green patches, of one or two inches in diameter.

The *Roots*, which consist of minute, whitish, simple fibres, descend from the under side of the plant, in various places, but chiefly from its centre, and immediately below the insertion of the calyx (f. 8.)

A single individual scarcely exceeds three or four lines in length. The *surculi* are procumbent, divided from a centre, with branches extremely slender, filiform, flexuose, mostly simple, but, sometimes, again irregularly divided. Their *color* a very light green; their *substance* diaphanous, filled with somewhat ovate cellules, placed at a distance from each other.

Leaves (f. f. 3. 4. 5) arranged at very regular intervals and somewhat closely, in two rows, patent, about the twentieth of a line in length, or a little less towards the extremity of the barren shoots, though the reverse is the case with those leaves that approach the calyx: each is, at its base, semiamplexicaul, of a lato-ovate figure, divided from the apex, for about one half of its length, by an acute sinus, into two ovate or lanceolate sharp and almost conduplicate segments, which, at their margins, are remarkably and elegantly fringed with rather large spiniform teeth of unequal size. The *color* of the leaves is an extremely pale yellow-green; the *cellules* are ovate, and, as in the surculus, placed distantly, yet in regular longitudinal series.

(*J. Turneri*.)

BRITISH JUNGERMANNIÆ.

Perichætal leaves (f. f. 6. 7) closely imbricated on all sides of the calyx, and differing from the cauline ones in being of a quadrate figure, frequently broader than they are long, and in being cleft for only about one third of their length, into three or four ovate, acute, spinuloso-dentate, erect segments.

MALE FRUCTIFICATION unknown.

FEMALE FRUCTIFICATION terminal upon the surculi.

Calyx lineari-oblong, about one third or even half a line in length, longitudinally, yet slightly, plicate or obtusely angular; in a young state a little incurved, at a more advanced period, erect; its color almost white, having, however, generally, a yellowish tinge. The *cellules* are oblong, and, as in the rest of the plant, rather distantly placed.

Germen (f. 8) ovate, attenuated at the base, tipped with a short style.

Calyptra (f. 9) ovate, reticulated, brownish-white.

Peduncle a quarter of an inch long, white, succulent, cellulose.

Capsule (f. 10) ovate, brown, splitting into four valves of equal size.

Seeds and *spiral filaments* (f. 11) fulvous; the former spherical and smooth; the latter composed of a double *helix*.

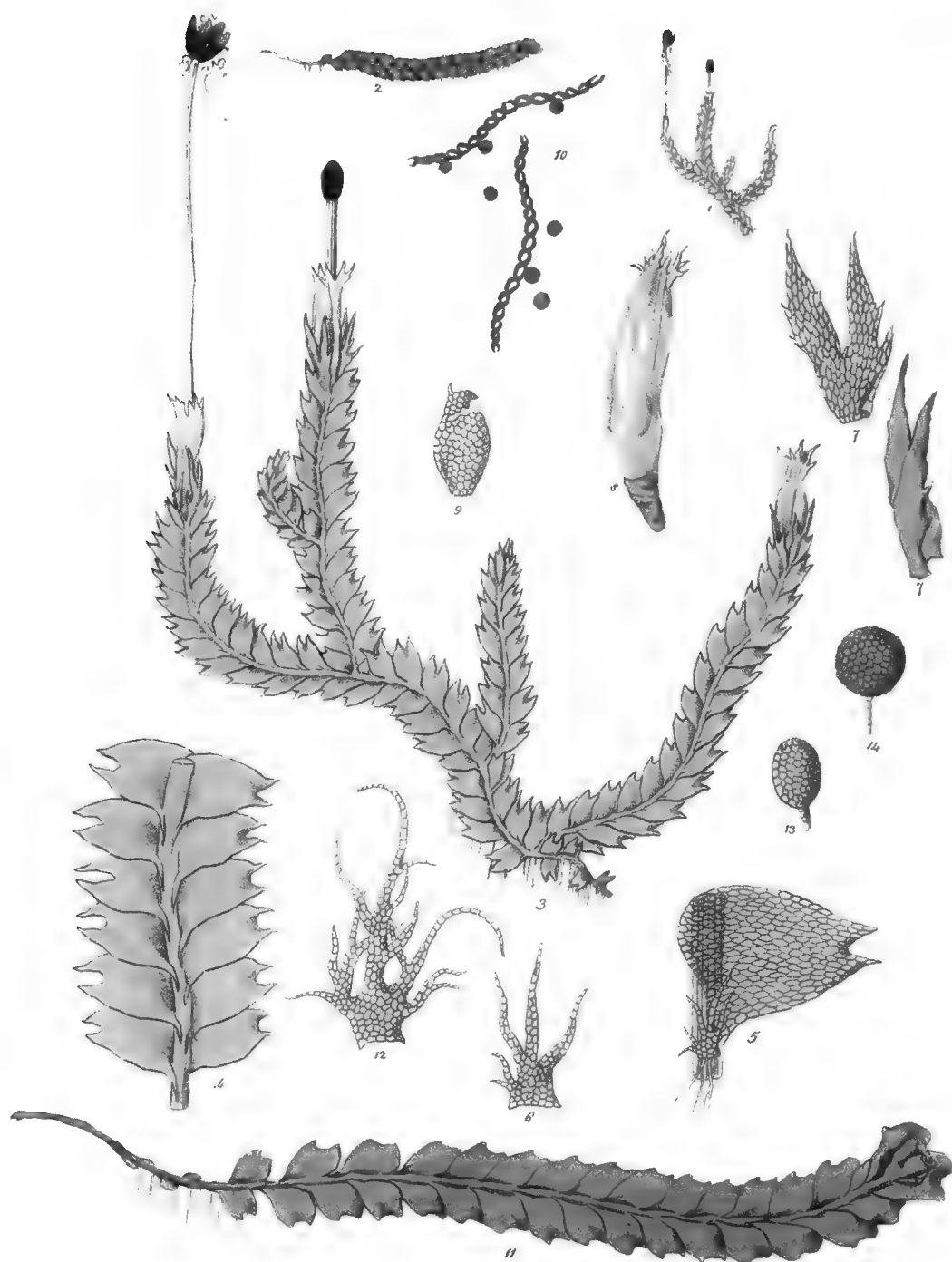
Throughout the progress of this publication, I cannot promise myself a more grateful task, than that of dedicating a small but most elegant species of my favorite genus to Dawson Turner, Esq., as a memorial of the great and undiminished kindness which I have for many years received from him. To his friendly advice and instructions the present work is indebted for whatever merits it may possess. *J. Turneri* has hitherto been found alone in the neighborhood of Bantry, and is one of the many interesting additions that have been made to the Cryptogamic Flora of the British Isles, by Miss Hutchins. It is not a little remarkable that this is the second species of *Jungermannia*, discovered by this lady, that is distinguished from all the rest of its affinities (which, in the present instance, I need hardly say, are *J. bicuspidata*, *J. byssacea*, &c.) in having the leaves dentated in a very conspicuous and strikingly beautiful manner: the former plant of this description is *J. Hutchinsiae*, represented on the first plate of this Monograph; and I have, on this account, the greater pleasure in affixing to the species the names of two botanists, who have alike rendered themselves celebrated by their knowledge and discoveries.

Besides the dentate leaves, there is another peculiarity possessed by the present plant, that I have not observed in any other of the genus: this is in the large cellules with which the whole of the foliage and surculi appear to be studded, in the same manner as the leaves of *Dicranum pulvinatum* and a few other mosses; for, though these are distantly placed, they are, nevertheless, arranged in longitudinal and parallel lines.

REFERENCES TO THE PLATE.

FIG.

1.	<i>J. Turneri</i> , female plant, natural size.	
2.	The same magnified	6
3.	Portion of the surculus and leaves	4
4, 5.	Cauline leaves	3
6.	Exterior perichætial leaf	3
7.	Interior perichætial leaf	3
8.	Receptacle of the fructification, with the leaves removed, to exhibit the cellules of a portion of the surculus	3
9.	Calyptra	3
10.	Barren pistilla	2
11.	Seeds and spiral filaments	1



Jungmannia bidentata.

JUNGERMANNIA BIDENTATA.

(TAB XXX.)

JUNGERMANNIA, surculo procumbente, ramoso: foliis latè ovatis, decurrentibus, bifidis; segmentis valdè acutis integerrimis; stipulis bi- tri- fidis laciniatisque: fructu terminali; calycibus oblongis, subtriangularibus; ore laciniato.

Jungermannia bidentata. LINN. *Sp. Pl.* II. p. 1598. *Syst. Nat.* II. p. 705. POLLICH, *Pal.* III. p. 180. SCOPOLI, *Carn. ed.* 2. II. p. 349. LEERS, *Herb.* p. 249. (excl. var. β .) WEIS, *Plant. Crypt.* p. 115. (excl. var. β .) WEBER, *Spic. Fl. Goet.* p. 133. (excl. var. β . γ . δ .) WILLD. *Ber.* p. 340. OEDER, *Enum. Pl. Fl. Dan.* p. 41. ALLIONI, *Fl. Ped.* II. p. 312. VILLARS, *Delph.* III. p. 924. SCHREBER, *Spic. Fl. Lips.* p. 104. HOFFMANN, *Germ.* II. p. 89. ROTH, *Germ.* III. p. 392. (excl. var. β .) RELH. *Cant.* p. 438. HUDS. *Angl.* p. 511. LIGHTF. *Scot.* II. p. 773. WITH. III. p. 853. (excl. var. 2.) LINN. *Syst. Nat. ed. Gmel.* II. p. 1348. LAMARCK, *Encycl. Bot.* III. p. 279. *Engl. Bot.* t. 606.

Lichenastrum trichomanis facie, foliolis bifidis, majus. RAII *Syn.* p. 113. n. 19.

Jungermannia major, repens, foliis bifidis. MICHELI, *Nov. Gen.* p. 8. t. 5. f. 12.

Hepaticoides Polytrichi facie, foliis bifidis majoribus. VAILLANT, *Par.* p. 99. n. 3. t. 19. f. 8.

Lichenastrum pinnulis acutioribus, concavis, bifidis, majus. DILL. *Musc.* t. 70. f. 11.

Jungermannia foliis bifidis, in ramo florifero majoribus. HALL. *Helv.* III. p. 62. n. 1877.

β . OBTUSATA; foliis obtusè emarginatis, atro-viridibus; stipulis multifidè divisis.

HAB. Very plentiful in moist and shady situations; upon hedge-banks and trees, particularly among moss.— β is found by the *Rev. R. B. Francis* in very wet and boggy parts of Holt Heath.—(α abounds with calyces during the greater part of the year. Male fructification has been found by Mr. Lyell and myself in great perfection in the months of October and November.)

PLANT growing in more or less crowded patches of some inches in diameter.

Roots small whitish fibres, proceeding here and there from various parts of the under side of the *surculi*, generally, however, immediately below a stipule (f. 5).

Surculi from an inch to an inch and an half long, procumbent, flexuose, branched, with the branches often erect towards the extremity, simple, or occasionally producing a short lateral shoot; their *color* varies from a pale, to a deep, and almost black green, in certain situations; the *texture* is rather firm, the *cellules* compact.

Leaves (f. f. 4. 5) from half to three quarters of a line or even more in length, closely placed, but scarcely so much so as to be imbricated, in a bifarious manner, plane, or very slightly waved, horizontal, of a widely ovate* figure at the base, half surrounding the stem, and having the lower margin very much decurrent; at the extremity they are divided for about one fourth or one fifth of their length, with a sinus more or less acute, into two, equal†, sharp, and strait segments, the tips of which resemble minute cilia or teeth, whence the plant has its name. The *color* of the leaves is always a singularly light green, sometimes almost approaching to white; the *texture* thin; the *cellules* large, and forming, with their interstices, a beautiful sort of reticulation.

Perigonal leaves about ten or twelve in number, either placed quite at the extremity, or at the middle of a branch, ventricose, crowded, and lying closely imbricated over one another in two rows, as is the case with those of *J. asplenioides*; in like manner, also, their apices are recurved, and divided into two, three, or even four sharp and often unequal segments.

The *Perichætal leaves* (f. 7) may be said to commence with the second pair of leaves from the calyx, which, however, scarcely differ from the rest, except in being longer and more inclined to be erect; the first pair are twice the length of the cauline leaves, quite erect, and appressed to the calyx, deeply divided into two, equal, lanceolate segments, which are here and there dentate or ciliate on the margins.

Stipules (f. 6) one to every pair of leaves, appressed to the under side of the surculus, oblong, generally divided into two, and sometimes three, principal segments, which are variously laciniated.

The MALE FRUCTIFICATION, which I was not fortunate enough to possess in a good state, till it was too late to add it to the figure, is readily discovered by the singular disposition of the perigonal leaves, in the axillæ of each of which are situated two or three spherical or somewhat ovate *anthers*, terminating short, white, transversely striated *footstalks* or *filaments*.

FEMALE FRUCTIFICATION terminal upon the surculi and upon the small lateral shoots.

Calyx (f. 8) about a line long, sometimes slightly incurved in an early state of the fructification, ovato-oblong, obtusely triangular; the mouth, though slightly contracted, previously to the emission of the capsule, is afterwards somewhat expanded, it has a rather deep incision on one side, and is bordered with numerous *laciniæ*. The *texture* and *color* of the calyx scarcely differ from those of the leaves.

Calyptra (f. 9) pale brown, thin, reticulated: *style* short, tubular.

* Weber describes the leaves to be "ex ovato subquadrata;" which does not exactly correspond with those of our plant

† According to Dr. Smith's figure and description, in *English Botany*, it would appear that the segments are occasionally of unequal size: I have never remarked them to be so myself.

BRITISH JUNGERMANNIÆ.

(*J. bidentata*.)

Peduncle about three quarters of an inch in length, white, succulent, cellulose, a little waved when it has reached its full height.

Capsule exactly ovate, deep brown, longitudinally and transversely furrowed, splitting, at maturity, into four equal valves.

Seeds and spiral filaments (f. 10) of a rich, fulvous brown; the former spherical, the latter composed of a double *helix*.

β I am induced to notice as a distinct variety, because, among the many specimens I have examined, I have scarcely found any differ at all from the figure here given. It is generally of a larger size than α, and simple; the stem and leaves darker; the latter slightly concave and obtusely emarginate at the extremity, with the points or segments more or less blunt. The stipules, too, I have always remarked, are more irregularly divided into more numerous laciniae.

J. bidentata may be reckoned among the most common of the tribe, and I was formerly of opinion that it might also be considered as one of the most distinct, till my friend, Mr. Francis, pointed out to me the Var. β growing in the vicinity of his residence; and Miss Hutchins kindly communicated a plant, which, though it has many peculiarities in common with the present species, yet has marks of discrimination so striking, that I am induced to reserve a more full description of it for another part of this publication. It will be sufficient in this place to observe, that it is distinguished from *J. bidentata* in having the leaves cut into three, more frequently than into two, segments; and in either case they are very distinctly, but irregularly, toothed. In the *perichætal leaves* this denticulation is still more obvious. The *stipules*, also, instead of being variously lacinated, are regularly bifid, with the segments only slightly toothed. The characters, which distinguish *J. bidentata* from *J. heterophylla*, will be enlarged upon in the following description; so nearly, however, do the two plants approach, that, by some writers on the subject, they have been looked upon as mere varieties of each other; and, indeed, such was formerly my own opinion.

The agreeable smell that has frequently been noticed as diffused by this plant, appears to be by no means confined to it alone. Dr. Schrader under his *J. graveolens* (which appears closely allied to our *J. trichomanis*) remarks “Odor plantæ recentis gravis, *Scandici Cerefolio* hæud dissimilis.” In *J. bidentata* I have observed the scent to be more powerful after the plant had been dried for a few days, and then recovered by an application of moisture.

On this *Jungermannia* I have more than once had the opportunity of observing that pistilla are formed before the calyx, and, by examining the terminal clusters of leaves*, they may not

* Such leaves I have generally found to be divided into two, three, or even four segments, at the extremity, and these varying much in size and direction. Is it not possible that these may unite and form the calyx? An incision, more or less deep, is generally seen in one or other of the angles, as if the leaves (supposing such a change to take place) had not been united quite to their apices. The same appearance, also, may be remarked in *J. heterophylla* (see t. 31. f. 12.), in *J. asplenoides*, and *J. spinulosa*.

(*J. bidentata*.)

BRITISH JUNGERMANNIÆ.

unfrequently be found completely destitute of this part. In *J. complanata*, also, the calyx is to be seen in an extremely diminutive state, at the same time when the pistilla are fully formed; and I have reason to believe that this mode of growth, far from being confined to these two plants, is not unfrequent in the genus.

Schmidel's *J. bidentata* I have elsewhere mentioned as belonging to *J. ventricosa*.

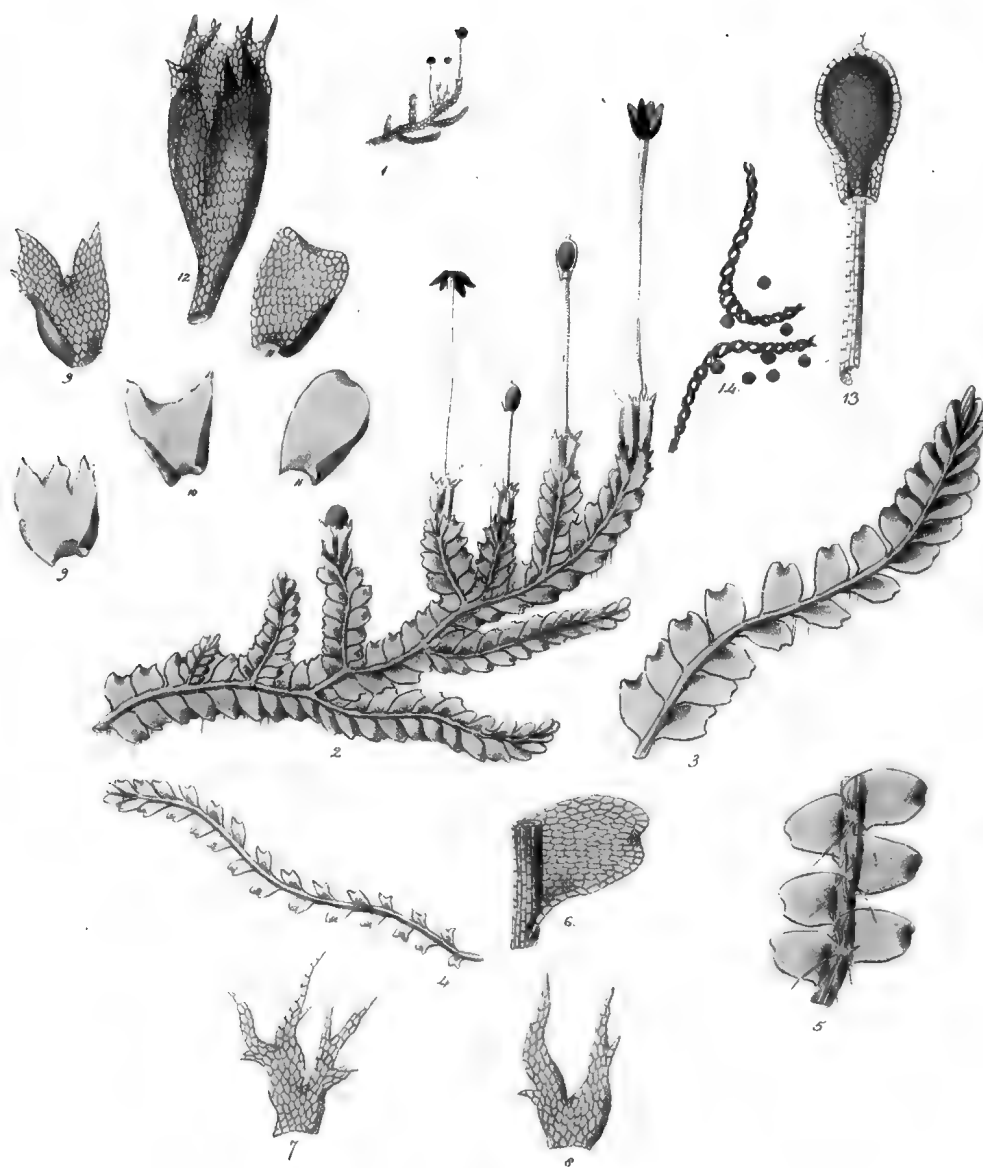
Schreber is the first person who discovered the stipules on this species. They are sufficiently large to be distinguished with a small power of the microscope, and are always present, throughout the whole length of the plant.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. bidentata</i> (female plant), natural size.	
2. <i>Var. β</i> , natural size.	
3. Female plant, magnified	6
4. Portion of a surculus and leaves	4
5. Leaf, seen from its under surface, with a stipule	3
6. Stipule	2
7. Perichætical leaves	4
8. Calyx	4
9. Calyptra	2
10. Seeds and spiral filaments	1
11. <i>Var. β</i> , obtusata, magnified	6
12. Stipule of <i>Var. β</i>	2
13, 14. Anthers *	1

* These anthers, it ought to be remarked, were taken out of the terminal tufts of leaves of *Var. β*, probably before the formation of the perigonal leaves, which have been described above.



Jungermannia heterophylla.
(Jungermannia heterophylla) Schrad. & Sm.

JUNGERMANNIA HETEROPHYLLA.

(TAB. XXXI.)

JUNGERMANNIA, surculo procumbente, ramoso: foliis rotundato-ovatis, decurrentibus, apice rariùs acutè, plerumque obtusè emarginatis, integrisve: stipulis bi- tri- fidis, hic illuc sublaciniatis: fructu terminali; calycibus ovatis, obtusè triangularibus; ore laciniato.

Jungermannia heterophylla. SCHRADER, in *Journal für die Botanik*. v. p. 66.

Jungermannia bidentata. β . *minor*, LEERS, *Herb.* p. 249. (*excl. syn.* HALLERI. 1865.) WEIS, *Plant. Crypt.* p. 116. (*excl. syn.* MICHEL. t. 5. f. 13. et HALL. *Helv.* 1865.) WEBER, *Spic. Fl. Goet.* p. 134. WITH. III. p. 853 ?

Jungermannia bicuspidata. *Engl. Bot. t.* 281. (*excl. syn.*)

Lichenastrum pinnulis obtusioribus bifidis, minus. DILL. *Musc.* p. 488. t. 70. f. 12. (*excl. syn.* MICHELI.)

HAB. First detected in this country, by the *Rev. R. B. Francis*, growing on decaying stumps of trees in Edgefield Wood; also at the foot of alders in Hanworth Meadows, Norfolk, and in an alder car, at East Sheal, Lincolnshire. I have since found it not rare in similar situations in various parts of Suffolk, as well as very abundantly upon rocks at Tunbridge Wells.—Mr. Lyell has also discovered it in the New Forest, Hampshire, where he has observed the male fructification to be produced in November. The female is found in the early spring months.

PLANT growing in rather small and loosely-entangled patches, frequently among moss.

The *Roots* in the present, as well as in the species last described, originate here and there from nearly the whole length of the under side of the plant, but mostly in small tufts immediately below the stipules (f. 5).

Surculi from half to three quarters of an inch in length, procumbent, flexuose, with their apices, as well as those of the simple shoots and ramuli, erect, of a pale green color.

Leaves (f. f. 2. 3. 4. 5. 6) scarcely ever exceeding half a line in length, frequently less, especially at the base, and towards the extremity of the plant; more or less closely

placed, in different individuals, plane, or very slightly concave, bifarious, horizontal, of an ovate figure approaching to round, at the base semiamplexicaul and decurrent, at the extremity varying in a very remarkable manner, whence the species has most justly been named, by the acute Schrader, *heterophylla*. Scarcely two individuals are found to correspond exactly, throughout all the leaves, in the figure of this part, though, in general (f. 2), it may be considered as being, in those placed nearest to the base of the stem, acutely divided for about one fifth of its length from the apex into two acute segments, which are divaricate in a slight degree; while those of the middle of the surculus have it obtusely emarginate, with the segments also obtuse, sometimes truncate, without any notch; and, as the leaves approach the extremity of the plant, they are quite entire, rounded off, and frequently more ovate than the rest. In other specimens, however, the leaves are sometimes all emarginate (f. 4), or, here and there, and without any kind of regularity, intermixed with some that are entire, whilst others are acutely cleft; and I have lately received from Mr. Lyell specimens, among which were individuals having their leaves so nearly entire throughout, that, had it not been for the calyx and stipules, they might easily have been mistaken for a distinct species. In all, the color is a pale green, varying, from situation, to a deeper hue: the *cellules* large and ovate.

Perigonal leaves, as those of *J. bidentata*, closely imbricated in two rows, at the base ventricose, the extremity somewhat revolute, emarginate or entire: they are found as well upon the same plant with the female fructification, as upon different individuals, and often immediately below the *perichaetial leaves* (f. f. 9. 10. 11):

These are still more remarkable for their difference of form than the cauline ones: in some they are altogether entire; in others both bifid and entire; whilst some again are found which have the third pair from the calyx very obtusely emarginate (f. 11), with blunt segments; the second pair deeply, but obtusely, emarginate, with acute points, and these slightly dentated (f. 10); and the first, or calycine pair, varying with two or three acute, ovate segments, of different sizes, distantly and unequally toothed (f. f. 9. 9); these last are generally erect and appressed to the lower part of the calyx.

Stipules (f. f. 7. 8) one to each pair of leaves, appressed to the lower side of the stem, oblong, bifid or trifid, with the segments more or less divaricating, and here and there toothed or laciniated.

MALE FRUCTIFICATION. *Anthems* situated in small clusters, exactly resembling those of *J. bidentata*.

FEMALE FRUCTIFICATION terminal upon the extremity of the surculi and short branches, as well as upon some so short, that, without a careful examination, they might be supposed to be lateral.

Calyx (f. 12) scarcely three quarters of a line long, ovate, with the sides very obtusely triangular, or even round (supposing a transverse section); the mouth expanded, slit some way down on one side, and much laciniated.

Calyptra ovate, thin, and delicate. I have gathered plants which had (probably in consequence of weakness in the capsule or footstalk) carried up the calyptra entire, with the fruit, as in the mosses, and, though not in so perfect a state, in *Andrea* (f. 13).

BRITISH JUNGERMANNIÆ.

(*J. heterophylla*.)

Capsule ovate, dark brown, dividing into four equal ovato-lanceolate valves, and discharging the numerous

Seeds and spiral filaments, which are of a fulvous color.

J. heterophylla was well known to Dillenius, who justly says of it in his description, "Pinnulæ breviores et obtusius minùsque profundè ac precedentis (*J. bidentata*) et sequentis (*J. bicuspidata*) speciei, incisæ sunt". Other authors, however, have considered it as only a variety of *J. bidentata*. It differs from that plant in the following particulars. Its mode of growth, as far as I have been able to discover, is always in small and straggling patches, even when growing unmixed with mosses. Its fructification is far more abundant. Its size is much less. The leaves, though so variable in figure, are never, that I am aware of, acutely divided into two equal and strait segments. The stipules are less laciniated. The calyx shorter in proportion to its width, somewhat less angular, and the mouth more open. Some of the leaves undoubtedly bear a considerable affinity with those of *J. bidentata* β , and it is probable that Mr. Francis is correct in his opinion, in supposing this variety to belong to the present plant. I have, nevertheless, been tempted to consider it rather as a varying appearance of the former species, from the circumstances of the plant being larger even than the α of *J. bidentata*, of the leaves being always emarginate, and of the stipules being so much laciniated.

An examination of authentic specimens of *J. heterophylla*, which Dr. Schrader communicated to Mr. Turner, leaves me no doubt as to the identity of our British plant; and that author describes the same stations for it in Germany as those in which it is found with us; "ad truncos arborum, imprimis emortuarum ubique fere, haud infrequens occurrit". The Hallerian synonym, quoted by Leers and Weis, I have more reason to think belongs to *J. ventricosa* (under which species I have placed it) than to the present; and I am inclined to the same opinion with regard to the Michelian synonym of the latter writer.

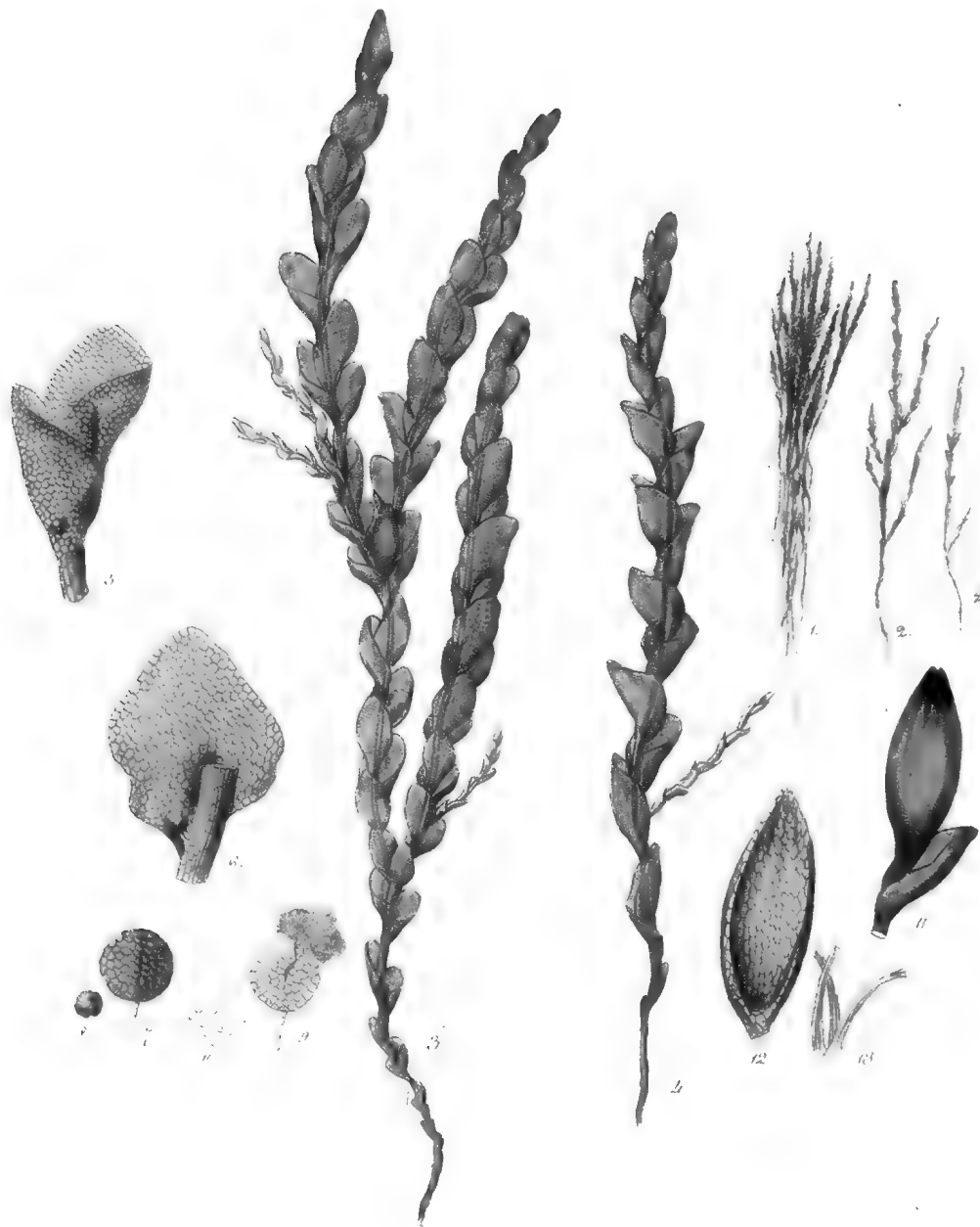
REFERENCES

REFERENCES TO THE PLATE.

FIG.

1. <i>J. heterophylla</i> (female plant) natural size.	
2. The same, magnified	6
3. Portion of the surculus and leaves, magnified	5
4. Portion of a surculus and leaves	6
5. Portion of a surculus and leaves, seen from behind	4
6. Leaf	3
7, 8. Stipules	2
9. Inner perichætial leaves	3
10. Intermediate perichætial leaves	3
11. Exterior perichætial leaves	3
12. Calyx	3
13. Capsule with its calyptra	3
14. Seeds and spiral filaments	1





Jungermannia cordifolia.
Jungermannia cordifolia (L.) Nees

JUNGERMANNIA CORDIFOLIA.

(TAB. XXXII.)

JUNGERMANNIA; caule erecto, flexuoso, dichotomo: foliis erectis, concavis, cordatis, circumvolutis: fructu terminali axillarique; calycibus oblongo-ovatis, subplicatis; ore minuto, denticulato.

HAB. Highland Mountains of Scotland, in many moist situations.—*Mr. Woods* finds it in Ireland; and *Mr. Lyell*, at Isla and Catlaw, in Angus-shire. (Calyces were discovered, with swollen germen, on the thirty-first of August, by *Mr. Lyell*.)

PLANT growing in rather dense tufts, conspicuous from their black appearance, one or two inches in diameter.

Root a very few minute, simple fibres, proceeding almost wholly from the base of the plant. *Stems* varying from one to two and even three inches in height, flexible, waved, cellular, always erect and filiform, sometimes simple, but more frequently branched in an irregularly dichotomous manner; with branches of uncertain length, simple, or at most producing one or two young lateral shoots; their *color* a dirty green or brown.

Leaves bifarious, rather distantly placed, from half a line to a line or more in length; the lower and the terminal ones generally the smallest: all of them erect, or erecto-patent, loosely imbricated, cordiform, concave, with their margins embracing the stem so as entirely to conceal it: their *texture* is extremely thin, membranous and subdiaphanous; the *cellules* of a roundish figure; their *color* a very dark olive or almost black green, varying, in some situations, to a deep purple towards the extremity of the plant. The leaves on the *innovations* exactly resemble the rest in figure, but are much smaller and have their margins more involute and more closely embracing the stem; the apices, however, are a little patent, so that these young shoots at first sight have somewhat the appearance of a *Sertularia*. In drying, the leaves become much crisped, and do not recover in water without much difficulty.

(*J. cordifolia*.)

BRITISH JUNGERMANNIÆ.

The *Perigonal leaves*, which extend from the apex of a stem to nearly half way down its length, scarcely differ from the rest, except in having their base more concave.

The *Perichætal leaves* are also, in every respect, like the cauline ones.

MALE FRUCTIFICATION. *Anthers* situated in the axillæ of the perigonal leaves, large in proportion to the size of the plant, exactly spherical, reticulated, placed upon a short, pellucid, transversely striated footstalk. On pressing one of these with an instrument, while under the microscope, an extremely minute pollen, or granulated substance, was discharged, each particle of which was roundish, angular, and semitransparent.

FEMALE FRUCTIFICATION both terminal and arising from the axillæ of the branches.

Calyx oblongo-ovate, much lengthened out at the base, the upper part slightly plicate, the *mouth* small and very indistinctly toothed.

Germen ovate, dark green.

Barren pistilla eight or ten in number, linear, longitudinally striated.

The present is one of the most distinct of the British Jungermanniæ with which I am acquainted, nor can I mention any to which it bears the smallest affinity, either in the form of its leaves, or in the singular manner in which they embrace each other with their involute margins. The color too is very peculiar, being extremely dark, so that, when seen in tufts, it appears almost black. By immersion in water for a few hours, a deep brownish tinge is imparted to the liquid.

In the form of the calyx this species approaches *J. minuta*, but the calyx here is shorter in proportion to its diameter, and less plicate; the leaves of the two plants are very unlike, and so strikingly are those of the present species heart-shaped (when they are expanded, as at f. 6), and so much do they in their general direction resemble those of *Hypnum cordifolium*, that I have thought that the same specific name would also be applicable to the Jungermannia as to the Hypnum.

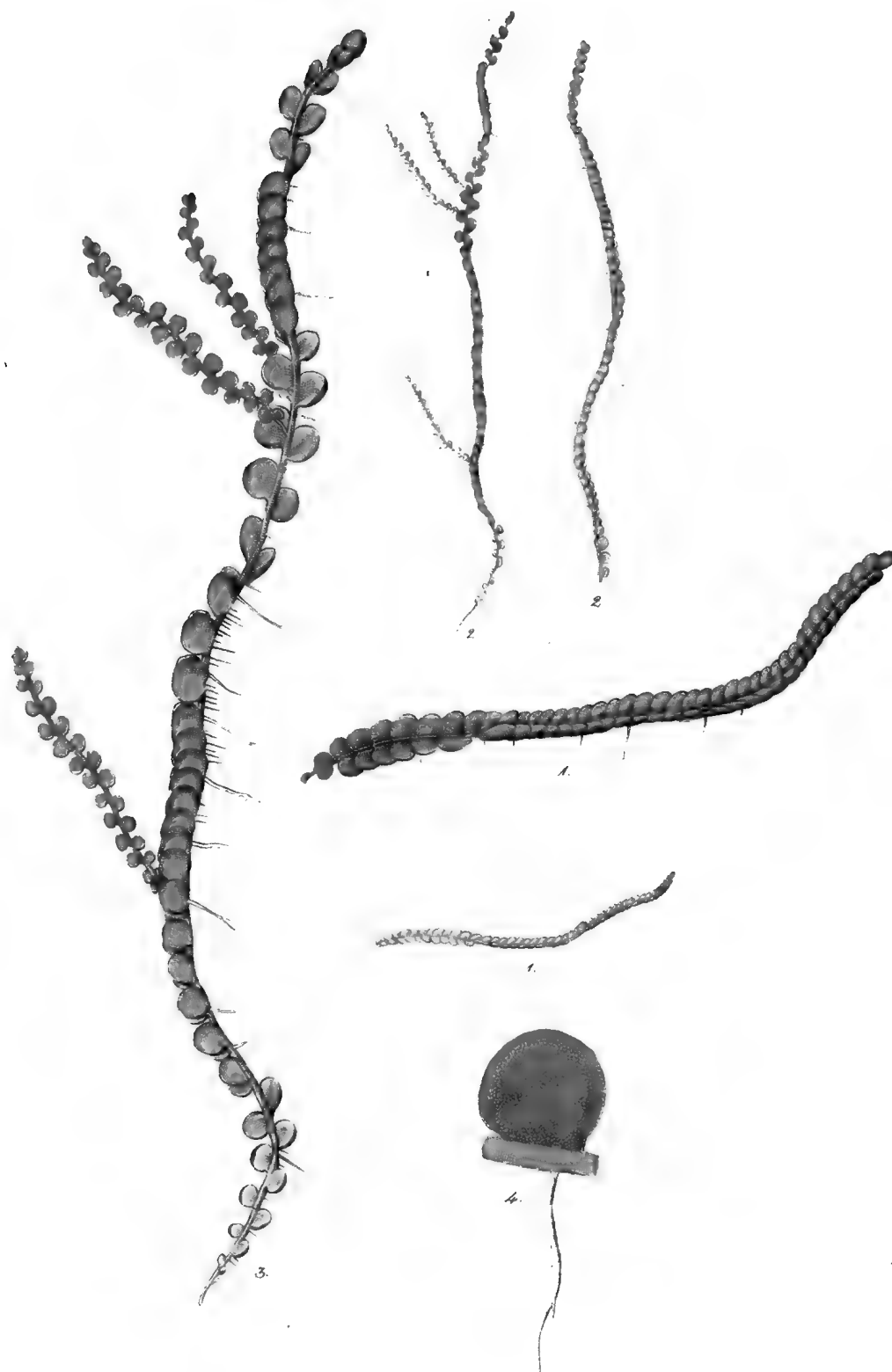
Mr. Dickson was probably the first person who gathered this plant; since I find it among a number of unnamed species that he has been so good as to send me, which were collected many years ago in the Scotch mountains. Mr. Woods has since gathered it in Ireland, and Mr. Lyell and myself in Scotland.

REFERENCES TO THE PLATE.

FIG.

1. <i>A small cluster of barren plants, natural size.</i>	
2. <i>Plants with male fructification, and the female in a young state, natural size.</i>	
3. <i>Plant bearing anthers and calyces, magnified</i>	6
4. <i>Male plant</i>	6
5. <i>Perigonal leaves</i>	4
6. <i>A single perigonal leaf expanded, to shew the form of the leaf and the axillary anther</i>	3
7. <i>Full-grown anther</i>	2
8. <i>Young anther</i>	2
9. <i>Full-grown anther broken, to exhibit the pollen</i>	2
10. <i>Pollen</i>	1
11. <i>Calyx</i>	5
12. <i>The same, longitudinally dissected</i>	4
13. <i>Pistilla</i>	2





Jungermannia Sphegii.
Odontocistrum Sphegii Dicks. var.

JUNGERMANNIA SPHAGNI.

(TAB. XXXIII.)

JUNGERMANNIA, caule procumbente, simpliciusculo: (elongationibus gemmiferis solummodò stipulatis!): foliis orbicularibus: fructu in ramis propriis terminali; calycibus oblongis, utrinque attenuatis; ore contracto, denticulato.

Jungermannia Sphagni. DICKS. *Crypt. Fasc.* 1. p. 6. t. 1. f. 10. HOFFM. *Germ.* II. p. 88. ROTH, *Germ.* III. p. 375. LAMARCK, *Encycl.* III. p. 280. WITH. III. p. 854. LINN. *Syst. Nat. ed. Gmel.* II. p. 1348. *Engl. Bot.* t. 2470.

HAB. Marshy places, particularly among *Sphagnum latifolium* and *capillifolium*.—Near Croydon. *Mr. Dickson*.—Holt Bogs. *Rev. R. B. Francis*.—Belton, near Yarmouth. *Mr. Turner*.—Near Belfast, Ireland. *Mr. Templeton*.—Bogs, on mountains, near Bantry. *Miss Hutchins*.—New Forest, Hampshire, most abundant; (bearing gemmæ in October and November, and young fructification towards the end of the latter month.) *Mr. Lyell*.

This remarkable PLANT grows either in loosely entangled patches of some inches in diameter, or more straggling, when attached to the stems of *Sphagnum*.

Roots of two kinds (f. 4): small *radicles*, such as are common to almost all the species of the genus, consisting of minute, whitish, simple, and pellucid fibres, proceed tolerably abundantly from nearly the whole length of the plant: but, among these, at uncertain distances, descend *radicles* of a much larger size, and from two to three lines long, of a whitish color, rather opaque, though I cannot perceive that they have any of the cellular texture; sometimes simple, but more frequently divided by three or four small lateral and descending shoots.

Stems from two to four inches in length, procumbent upon the substance that affords them nourishment, and consequently erect with regard to the horizon, when they are attached to the upright plants of *Sphagnum* (f. f. 2. 3), filiform, flexuose, simple, or only producing here and there short innovations, which resemble the main stems, and are of a yellowish-green color, while that of the principal stems is pale yellow-brown.

(*J. Sphagni.*)

BRITISH JUNGERMANNIÆ.

The *Leaves* (f. 4), which are in general about half a line in length, are bifarious, alternate, for the most part so closely placed that their margins are slightly imbricated over each other, though, sometimes, as may be seen at f. 3, they are more distant, and have often a vacant space between each pair: they are patent or erect, rarely horizontal, throughout of an orbicular figure, on the upper side concave, below convex. The *cellules* are at the extremities of the leaf nearly quadrate and regular in figure, giving the edge a slightly marginated appearance; in other parts they are roundish, and so minute as to be seen only with a tolerably high magnifier: the *color* varies from a rich yellow-brown to a pale yellow-green, having the tips of the leaves, and especially of those that are nearest the extremity of the stem, not unfrequently tipped with purple.

The *Perigonial leaves* I have not yet seen.

The *Perichætal ones* are confined to the short proper footstalk of the fructification, and are at its base roundish and entire, after which they become emarginate, and, the nearer they approach the calyx, the more frequently are they divided and lacinated; the uppermost are the largest, oblongo-ovate, and cut into five or six lacinated or toothed segments; their *substance* is more loosely cellular than that of the other leaves, their *color* a much paler and more yellow-green.

Stipules are discoverable on this plant, but only on the shoots which produce the *gemmae* which are also furnished with leaves of a much smaller size than those of the main stem, though similar to them in shape. Each *stipule* is oblong or ligulate, obtuse, entire, except in those that approach the extremity of the shoot, where they are emarginate.

MALE FRUCTIFICATION unknown.

FEMALE FRUCTIFICATION situated upon short proper footstalks, which are either lateral, originating from the under side of the plant, or terminal.

The *Calyx* is about a line and a half long, of an oblong figure, but attenuated at each extremity, extremely delicate, whitish, semipellucid (so as to shew the young capsule within), and slightly plicate; the *mouth* contracted and a little toothed. The fructification I have not seen in a more advanced state.

Gemmae are found in great abundance and perfection in October and November, always upon elongations of the extremity of the plant, which are readily distinguishable from the rest of the stem by their smaller size, by their gradually tapering towards the apex, by the diminutive leaves, and still more easily by the *stipules* which are confined to them; at least Mr. Lyell and myself have in vain searched for them throughout the rest of the plant. Both the terminal leaves and *stipules* are a little emarginate; and bear a few scattered *gemmae*, which are supported, in the form of little globules, sometimes single and sometimes two or three together, on the extremity of the shoot. Each particle is very minute, roundish, beset with a number of angles, pellucid, and of a pale yellow-green color.

It is to Charles Lyell, Esq., of Bartley Lodge, that the botanical world is indebted for most of the above interesting particulars relative to the fructification and gemmæ of *Jungermannia Sphagni*. The industry and researches of this gentleman in the tribe of plants which are the subject of this publication, have been unwearied, and his success (as these pages will amply testify) has been commensurate with his zeal. Till very lately Mr. Dickson's original specimen, from which his figure and description were taken, was the only one that had been found in fructification; and I exceedingly regret that it has not been in my power to add to the accompanying plate, figures of the specimens in that state which Mr. Lyell has so liberally communicated to me. They will, however, appear in a supplementary number, for which they are reserved.

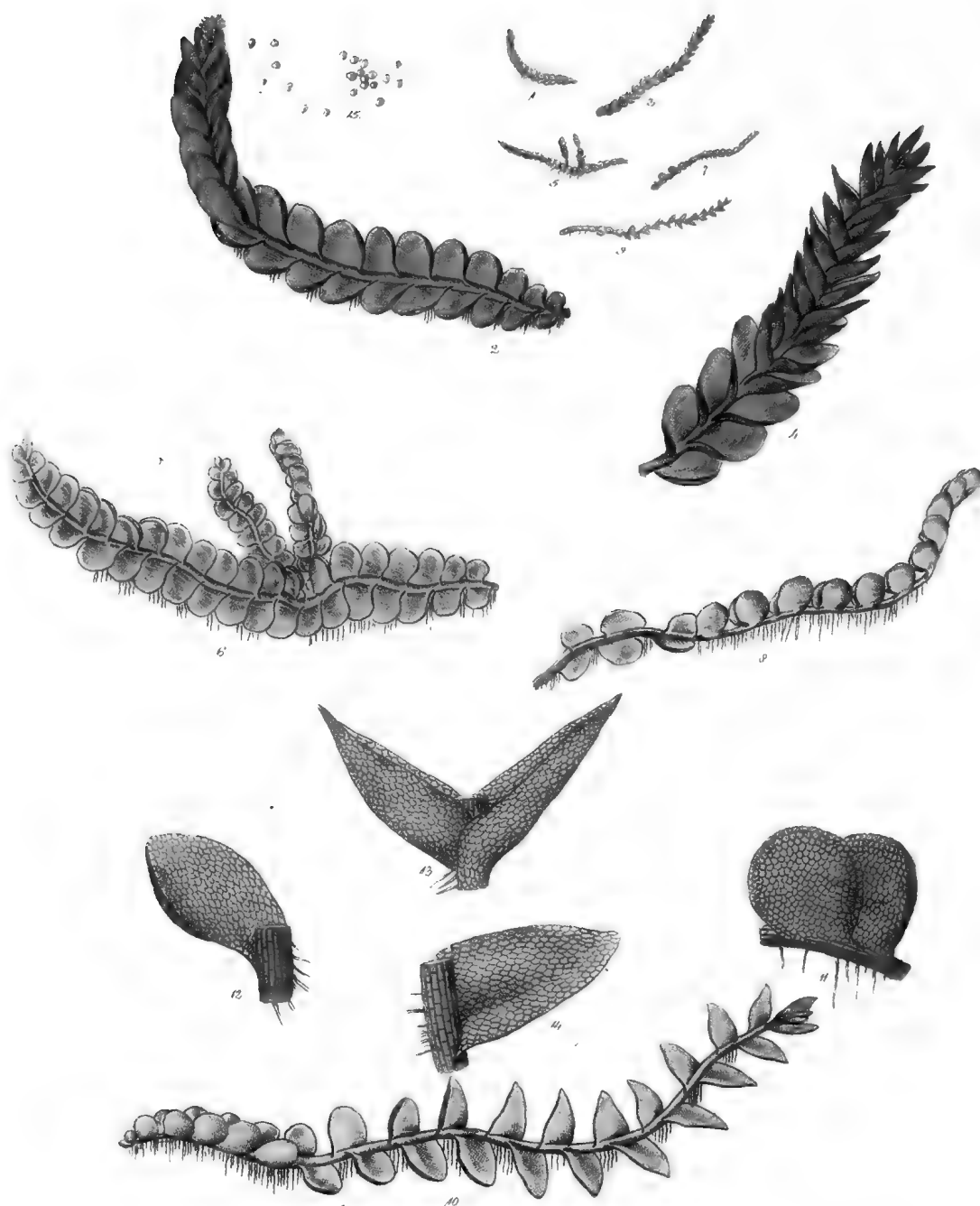
It is almost needless to point out the discriminating marks of a species so distinct as the present, and I shall content myself with observing, that the large radicles, and the peculiar form of the calyx, together with its proper footstalk, are, I believe, confined to this species. The leaves, also, though they bear no small resemblance, in general outline, to those of a new *Jungermannia*, which I propose calling *J. Taylora*, as well as to some of the leaves of *J. anomala*, and to those of *J. scalaris*, may always be known from those of other *Jungermannia*, by the firmness of their texture, and by the remarkable smallness of the cellules, combined with their general shape.

Although *Jungermannia Sphagni*, in a barren state, has been found in various parts of England and Ireland, yet the continental botanists seem to be scarcely acquainted with it. Hoffmann, indeed, Roth and Lamarck, have noticed it in their respective works, but they have copied, almost verbatim, the description of our English cryptogamist, Mr. Dickson. It is certainly found in Sweden, whence I have received specimens from Dr. Swartz.

REFERENCES TO THE PLATE.

FIG.

- | | | |
|-------|-----------------------------------------------------|---|
| 1, 1. | <i>J. Sphagni</i> natural size, and magnified | 6 |
| 2, 2. | <i>The same</i> , natural size. | |
| 3. | <i>J. Sphagni</i> , magnified | 6 |
| 4. | A leaf with a portion of the stem and roots | 3 |



Jungermannia anomala.
Leptocarpus anomalus (Hook.) Willd.

JUNGERMANNIA ANOMALA.

(TAB. XXXIV.)

JUNGERMANNIA, caule procumbente, simplice: foliis orbicularibus, his rotundato-ovatis, illis ovato-acuminatis: stipulis latè subulatis.

HAB. Holt Lows: Bogs on the south side of Edgefield Hill on the road to Holt; and in Holt Wood, growing both upon peat-earth and among *Sphagna*. *Rev. R. B. Francis*.—Westleton Bogs, near Halesworth, Suffolk; and boggy places in various parts of the Highlands of Scotland.—Summit of Devis Mountain, in the county of Antrim; and in Annahilt Bog in the county of Down. *Mr. Templeton*.—Near Bantry, growing among *J. excisa*. *Miss Hutchins*.—In bogs at Kinnordy, Kerrie-muir, and in the New Forest, Hants. *Mr. Lyell*.—(At the last-mentioned place *Mr. Lyell* finds Anthers in October. The *Gemmæ* are in great perfection in November.)

PLANT growing in loosely entangled and scattered patches, either attached to the earth, or, more frequently, to the stems and leaves of *Sphagna*, among which it is generally found.

Root consisting of numerous, small, whitish, pellucid, simple fibres, which descend from nearly the whole length of the under side of the plant.

Stems from one to two or even four inches in length, and about a quarter of a line or more in diameter, procumbent, flexuose, either simple or producing only one or two short lateral innovations from beneath the leaves: its *texture* is rather firm: its *color* varies from a yellow-green to a dark brown, and in some situations almost to a black; the innovations are of a more delicate texture, and more distinctly cellular, and partake more of the color of the leaves.

Leaves from half to three-quarters of a line long, more or less distantly placed in a bifarious manner, varying in their direction from horizontal to patent and (as is frequently the case) to erect, nor less variable in their shape, which is either orbicular, orbicular approaching to ovate, or altogether ovate, with acute apices: the orbicular leaves (f. 11) are in almost every instance concave on the upper surface and convex beneath: those of the second description (f. 12) are likewise slightly concave, whilst those that are ovate and acute are either plane (f. 14) or concave, or have their sides incurved (f. 13).

(*J. anomala*.)

BRITISH JUNGERMANNIÆ.

Orbicular leaves are sometimes found throughout the whole length of an individual; but it more frequently happens that those at the base of the stem alone are of this shape, and that thence they become more ovate and acute as they approach the extremity: at the extreme apex, three or four leaves (before their expansion) often embrace each other so closely as to form an oblong acute mass, which may, without due examination, be readily mistaken for a calyx.—It is to be observed that the upper leaves in *gemmaiferous plants* are often jagged at the point, or cut into two, three, or more unequal teeth. The *cellules* are throughout remarkably large in proportion to the size of the leaf, and are conspicuous to the naked eye, when the plant is in a dry state, by a punctated appearance; they are of a roundish form, except at the border, where they approach more nearly to quadrate (but scarcely in so regular a manner as to cause a margined appearance upon the edge), and in the ovate leaves the *cellules* are of a more oblong figure. The *color* is generally a rich but rather pale yellow-brown, the apices of the leaves often slightly tinged with purple.

Stipules small, subulate; one to each pair of leaves.

The *Perigonial Leaves* differ in no other respect from the rest, than in having a ventricose base near the insertion upon the stem, where the

MALE FRUCTIFICATION is situated. *Anthers* small, spherical, reticulated. *Footstalk*, or *Filament*, white, striated transversely.

FEMALE FRUCTIFICATION at present unknown.

OBS. *Gemmæ* are found on this species throughout the greatest part of the year, but most plentifully in the autumn. They form two or three rather compact spherical clusters, of a pale yellow-green color, at the apex of the terminal leaves, and some below them also bear them at their points, either in small globules or loosely scattered. Each particle is semipellucid, and roundish, but angular. It may be well to remark that the leaves, which support them, seem to be injured, and have their apices as it were corroded and jagged, after the dispersion of the *Gemmæ*.

J. anomala was first discovered by the Rev. R. B. Francis, who has for many years remarked it in his immediate neighborhood. I have also received it from other parts of England, as well as from Scotland and Ireland, but always without any of its parts of fructification, except the *Anthers*, which have once been found by Mr. Lyell. Dr. Swartz, too, has sent it to me from Sweden, gathered along with *J. Sphagni*.

The most striking features about this plant are the uncertain form of the leaves, varying, even on the same individual, from orbicular to ovato-acuminate, and the large size of the *cellules* in proportion to that of the leaf. In the former particular it has no affinity with any species with which I am acquainted, and in the latter it bears a resemblance only to *J. Taylora*, which also has *stipules* agreeing very nearly in figure with those of the present species. In both they are

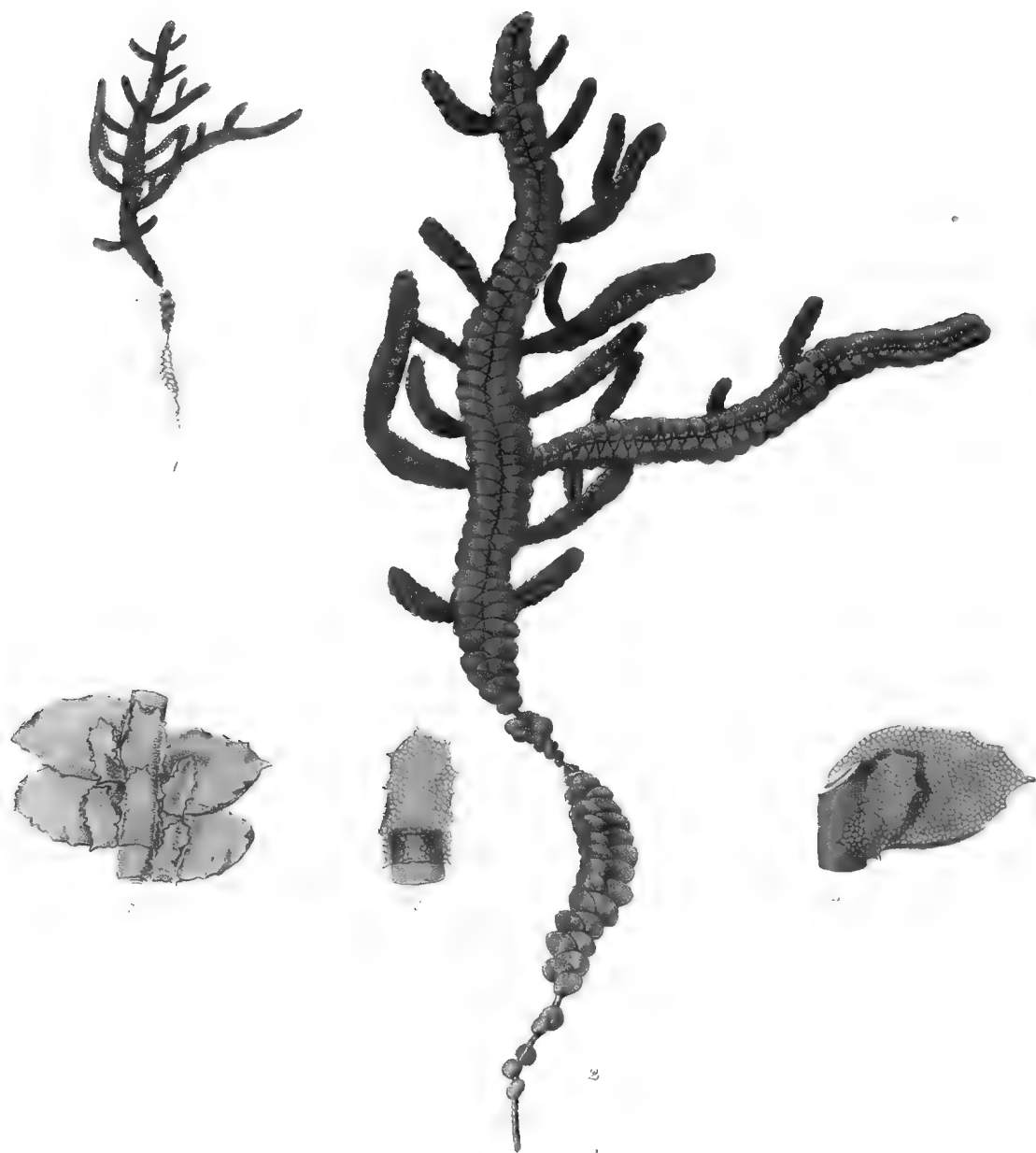
not discoverable without considerable difficulty, and in *J. anomala* they altogether escaped my notice till within these few days. They are most readily seen towards the extremity of the plant, all the rest of the under side of the stem being so much covered by the roots: though they there exist also.

The principal difference, therefore, between *J. anomala* and *J. Taylora*, consists in the presence of the ovate and acute leaves of the former, which are wholly wanting in the latter: other marks, though much less to be depended upon, may be found in the densely-crowded patches in which I have always seen *J. Taylora* grow, so that the individuals are forced into a nearly erect position; and in its color, which, in all the specimens that have fallen under my observation, has been far deeper, and generally with a purple tinge throughout. The fructification of this plant, which alone could remove all doubt respecting the specific difference of these individuals, has, unfortunately, not yet been discovered.

REFERENCES TO THE PLATE.

FIG.

1. *J. anomala*, gemmiferous plant, natural size.
2. The same, magnified 6
3. Barren plant, natural size.
4. Portion of the same, magnified 6
5. *J. anomala*, with orbicular leaves throughout, and innovations, natural size.
6. The same, magnified 6
- 7 and 8. The same, with the leaves erect, natural size and magnified 6
9. A more common appearance of the plant, natural size.
10. The same, magnified 6
- 11, 12, 13, and 14. Various leaves, magnified 3



Jungermannia laevigata.
Adiantum laevigatum Schradium.

JUNGERMANNIA LÆVIGATA.

(TAB. XXXV.)

JUNGERMANNIA, surculo procumbente, vagè bipinnatim ramoso: foliis bifariis, inæqualitèr bilobis, spinuloso-dentatis; lobis superioribus majoribus, rotundato-ovatis; inferioribus ligulatis, planis, appressis: stipulis oblongo-quadratis, spinuloso-dentatis.

Jungermannia lævigata. SCHRADER, *Syst. Samml.* II. p. 6. ROTH, *Germ.* III. p. 406.
LAMARCK, *Fl. Fr. éd. 2. t. II. p. 432?*

HAB. Upon the earth in a wood on the north side of the banks of Lochness.—*Mr. Brodie* has given me specimens found at or near the same place.—Communicated to me likewise by *Mr. J. T. Mackay*, whose brother, the late *Mr. Mackay* of Edinburgh, gathered it in Scotland.—Near Bantry, in a mountainous situation. *Miss Hutchins.*—Upon a rock, on the Castle-Hill, Kinnordy, Kerrie-muir, *Mr. Lyell.*

PLANT growing in loose patches, which lie over each other in an irregularly imbricated manner.
Root consisting of a few, very small, simple fibres, descending, at distant intervals, from the lower side of the plant.

Stems procumbent, flexuose, from two to three and even four inches long, beset with many distichous, nearly horizontal, scattered ramuli, which vary from half an inch to two inches in length, long and short being intermixed without order; the smaller ones simple, the larger again pinnated by a few short and simple shoots, equally irregular in point of size, number, and position: the whole of the branches are singularly attenuated at their origin, but then linear, and blunt at their points: their *texture* is firm: their *color* a dirty brown.

Leaves (f. f. 3. 4) in general about half or three-quarters of a line long, those at the base and extremity of the stems and branches smallest; it not very unfrequently happens that the even outline of the shoots, which is in general remarkable, is here and there interrupted

(*J. laevigata*.)

BRITISH JUNGERMANNIÆ.

by smaller leaves, or such as are decayed, as may be seen in f. 1 and 2. They are every where bifarious, closely imbricated over the upper side of the stem, and placed alternately, with great regularity and exactness; divided into two very unequal conduplicate lobes, of which the upper one is much the largest, convex on the upper surface, more or less smooth, and even glossy, of an ovate figure approaching to round, with its margin sometimes entire, but more frequently spinuloso-dentate, the teeth being of very unequal sizes, placed at distant but uncertain intervals, and generally incurved; the inferior division or lobe is scarcely one-third so large as the superior, to the under side of which it is closely appressed in a direction oblique with regard to the stem, its form is oblong or ligulate, its margins every where dentato-spinulose, with the teeth occasionally recurved. The *cellules* are very small, roundish; the *color* a dark olive-green, sometimes inclining to a yellow-brown.

There is one *Stipule* (f. 5) to each pair of leaves, oblongo-quadrate, and, equally with the lesser lobes of the leaf, which it exactly resembles in size and shape, spinuloso-dentate at the margin, having its teeth in like manner now and then recurved.

Dr. Schrader appears to be the first botanist who detected this species, and published it as distinct from *J. platyphylla*, to which I must confess it bears so close an affinity (and especially to the *var. Thuja*) in every thing, but the spinuloso-dentate margins of the lesser lobes of the leaves and of the stipules, that I cannot help offering it as my opinion that future discoveries may prove it to be a variety, though a very strikingly marked one. At the same time I must observe that, in all the specimens I have examined of *J. platyphylla*, I have never found the stipules and smaller lobes of the leaves to be otherwise than quite entire at the margins. The difference in size and in the smoothness of surface, mentioned by Schrader, will not hold good, the same being found often to exist in an equal degree in *J. platyphylla*.

Dr. Roth has done no more than copy the description of Schrader, and add synonyms from Micheli and Dillenius, which appear to me rather to belong to the *J. Thuja* of Dickson, so that no new light is thrown on the matter in his work. Lamarck also describes a plant under the name, *J. laevigata*, in his *Flore Française*, and cites Schrader's as a synonym; but his words are at variance with such a reference, so that, though I have thought it best to quote him above, I have done it with doubt, and I fear it must be admitted, from his description, that his *J. laevigata* is, in reality, a totally different species; "Les feuilles," to use his words, "sont nombreuses, serrées, embriquées, larges, courtes, très obtuses, presque tronquées, surmontées d'une petite pointe acérée, entières sur leurs bords, dépourvues de nervures et de stipules, disposées sur deux rangs d'une manière peu prononcée."

The fructification, which I have never yet seen, was also unknown to Schrader and Roth.

BRITISH JUNGERMANNIÆ.

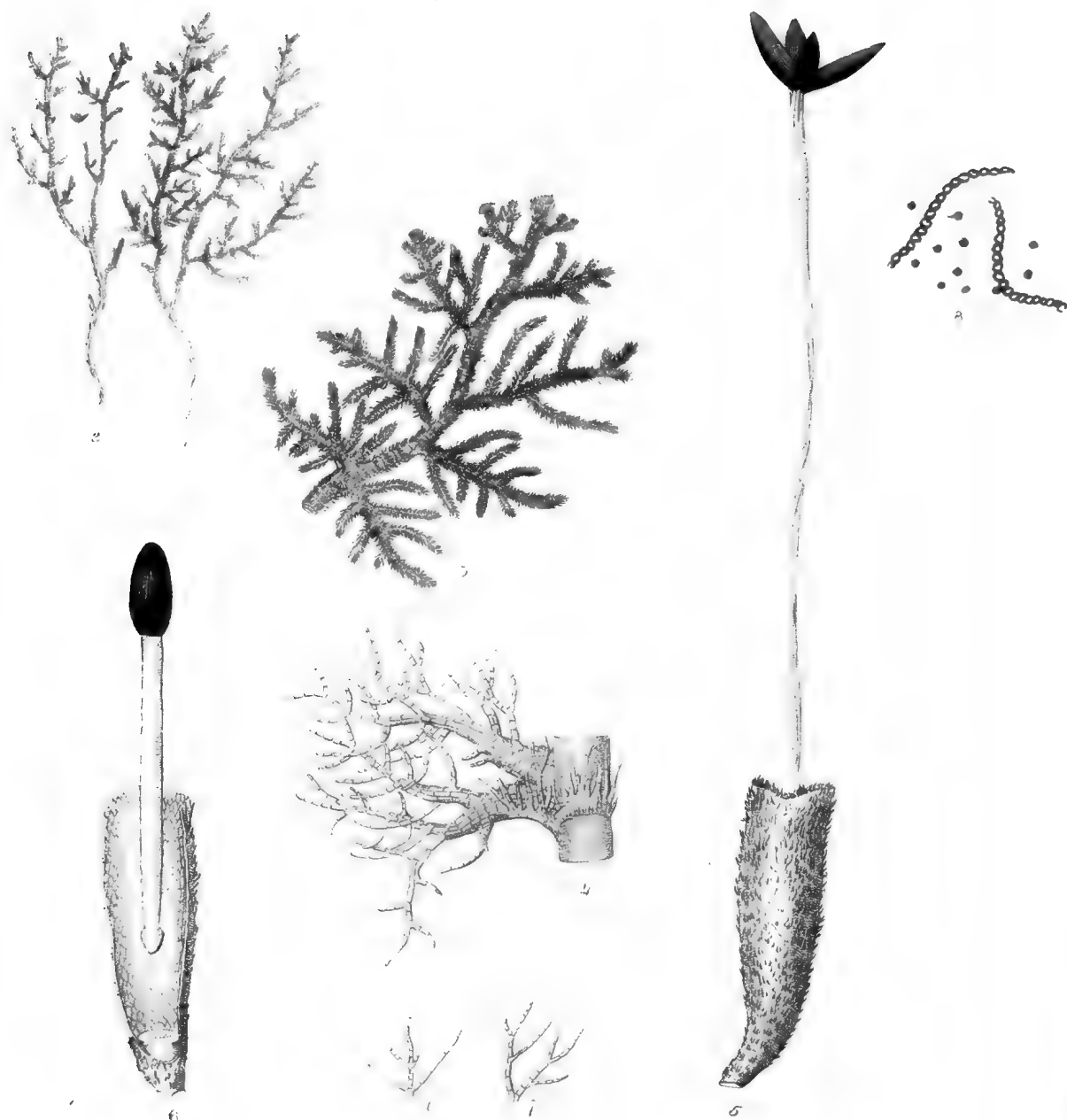
(*J. lævigata*.)

REFERENCES TO THE PLATE.

FIG.

- | | | |
|----|--------------------------------------------------------------------------------|---|
| 1. | <i>J. lævigata</i> , natural size. | |
| 2. | The same, magnified | 6 |
| 3. | Portion of the stem, with the leaves and stipules, seen from the under side .. | 4 |
| 4. | Leaf | 3 |
| 5. | Stipule | 3 |





Jungermannia tomentella.
Trichocolea lanuginella (Ehrh.) Don

JUNGERMANNIA TOMENTELLA.

(TAB. XXXVI.)

JUNGERMANNIA, surculo erectiusculo, bipinnato: foliis bifariis, inæqualitèr bilobis; lobis inferioribus minutis; superioribus bipartitis; utrisque apice margineque capillaritèr multifidis; stipulis subquadratis, laciniatis: fructu axillari; calycibus oblongis, cylindraceis, hirsutis; ore aperto.

- Jungermannia tomentella*. EHRH. *Beitr.* Band. II. p. 150. HOFFM. *Germ.* II. p. 83. ROTH, *Germ.* II. p. 401. DICKS. *Plant. Crypt. Fasc.* II. p. 14. LAMARCK, *Fl. Fr. ed. 2. v. II.* p. 436. LINN. *Syst. Nat. ed. Gmel.* III. p. 1351. MICHAUX, *Fl. Bor. Am.* II. p. 279. LAMARCK, *Fl. Gall.* p. 95. *Engl. Bot. t.* 2242.
- Jungermannia ciliaris*. WEIS, *Plant. Crypt.* p. 189. WEBER, *Spic. Fl. Goet.* p. 150. HUDS. *Angl.* p. 515. LAMARCK, *Encycl. Bot.* III. p. 284. WITH. p. 861.
- Muscus palustris, Absinthii folio, insipidus*. TOURN. *H. Pl. Par.* p. 505.
- Muscus filicinus perelegantèr crispatus*. PET. *Musc. n.* 438. (fide Dill.)
- Muscus Lichenoides, quasi filicis folia divisionibus suis referens*. RUPPII *Fl. Ien.* p. 403.
- Lichenastrum filicinum crispum*. RAII *Syn.* p. 111.
- Muscus palustris, Absinthii folio*. VAILLANT, *Bot. Par.* p. 141. t. 26. f. 11.
- Lichenastrum filicinum, pulchrum, villosum*. DILL. *Musc. t.* 73. f. 35.
- Jungermannia caule pinnato, foliis crispis capillaritèr multifidis*. HALL. *Helv.* III. p. 63. n. 1881.

HAB. Plentiful in moist places in various parts of the south, west, and north of England, as well as in Scotland and Ireland.—So abundant is it at Allan's Ford, near Durham, that Mr. Thornhill informs me he could, in a very short space of time, have loaded a cart with it.—(Mr. Lyell finds it with anthers in October, and Dillenius observes that the capsules are produced in the month of March.)

PLANT growing in densely crowded patches, often covering a space of ground of several feet in diameter, and rendered very conspicuous at a distance, from its extremely pale-green color.

Root scarcely any, except a few pellucid, short, and simple fibres, which may now and then be seen towards the base of the plant.

Stems * from two to three and even four † inches in length, and about the half of a line in breadth, nearly erect, flexuose; the primary division, which takes place near the base, is generally dichotomous, the rest of the plant is pinnated with patent, alternate, and somewhat distant branches, from three to five lines in length, which are, in like manner, often again beset with still shorter pinnulæ. The extreme ones are very slender and zigzag, somewhat resembling the rachis of an ear of barley. The *texture* is every where firm and compact, closely cellular, particularly in the lower part, where it is of a brownish hue; the rest is of a yellow-green *color*.

Leaves (f. 4) about half a line long, but, what is remarkable, scarcely larger on the main part of the stem than on the secondary branches; thus appearing as if these stems had outgrown the leaves, which are in that part also distantly placed: in the rest of the plant they are more or less closely imbricated over the upper part of the surculi, and at the extremity they form a thick head or tuft. Each is patent or horizontal with regard to the stem, divided into two unequal lobes, of which the lower one is the smallest, plane, conduplicate with the upper one, and appressed to its under surface: the superior lobe is plane, or very slightly convex, acutely cleft nearly down to the base into two linear or lanceolate segments, whose apices and margins, as well as those of the lesser lobe (though not in so great a degree), are divided and subdivided into many capillary segments of various lengths, and as variously curved, which give a tomentose appearance to the whole plant, and render the true figure of the leaf very difficult to be observed. The *cellules* of the leaf are oblong, rather large in proportion to its size; in the narrowest part of the branched segments they occupy the whole diameter, thus having a jointed appearance, resembling that of many *Confervæ*, and the curious leaves of *Jungermannia trichophylla* and *setacea*: and, like them too, the joints in drying are here and there frequently contracted. Their *color* is almost always a pale green, resembling that of *J. incisa*, though sometimes, as Mr. Lyell has observed, varying to a deeper hue; which happens, probably, whenever the plant grows in less exposed situations than usual.

In the *Perigonial leaves* I can distinguish no difference whatever from the rest.

Perichætal leaves (f. 7) wholly wanting, unless the pubescence that arises from the exterior surface of the calyx may be looked upon as such. This is composed of minute, capillary, and slightly-branched processes, which, under a high power of the microscope, are seen to resemble the narrowest of the lacinia upon the leaves, and like them have the jointed appearance of a *Conferva*.

Stipule one to every pair of leaves, subquadrate; generally about the width of the stem, cleft at the apex into a number of very narrow, and, frequently, branched segments.

MALE FRUCTIFICATION. *Anthers* situated on the upper surface of the stem, in the axillæ of the leaves, spherical, reticulated, of a greenish hue, and placed at the extremity of a short white footstalk.

* When the plant is dry, the distantly placed stipules, on the larger part of the stem, become visible, and give it the appearance of being jointed.

† Haller describes them as reaching to the length of half a foot, in the neighborhood of Berne, in Switzerland.

BRITISH JUNGERMANNIÆ.

(*J. tomentella*.)

FEMALE FRUCTIFICATION in the axillæ of the primary divisions of the stem.

Calyx (f. f. 5. 6) nearly a line and a half long, oblong, cylindrical, a little increasing in size towards the mouth, which is expanded and entire; its whole *substance* firm and subcarnose; indeed, as much so as that of the stem, with the nature of which it seems to agree. It is of a yellowish-brown *color*, and is, on its exterior surface, beset with those capillary branched processes, which I have described above as the perichæatial leaves: these form at the mouth a minute kind of fringe.

Calyptra none. (see f. 6.) At least, in the only specimen of the calyx that I had an opportunity of dissecting, I was not able to find any. It may, however, have been an injured one: yet I am acquainted with two foreign species of this genus that have, like the present, the perichæatial leaves arising from the calyx, in which I have universally found that the calyptra was wanting; a circumstance that tends to confirm my belief that the germen is here likewise destitute of that part.

Peduncle one or even two inches in length, striated, and often slightly twisted, fixed into the receptacle by means of a small obconical bulb, and terminated by the

Capsule, of an ovate shape, and deep purplish brown color; dividing at maturity into four equal valves.

The *seeds* and *spiral filaments* (f. 8), which I have only seen from an imperfect capsule, are of a fulvous *color*; the former spherical, the latter composed of a double *helix*.

J. tomentella is readily enough distinguished in its place of growth, from every other species, no less by its very pale color, than by the extent of ground occupied by its tufts. It bears considerable affinity with the *J. ciliaris* of Linnaeus; but, besides the great difference in color (*J. ciliaris* being always more or less of a rich yellow-brown), our present plant is much less convex in the upper surface of its leaves, which are divided into far narrower segments, and the laciniae are considerably longer, and more numerous, as well as greatly more branched, than is the case with that species, in which, moreover, the stems are almost always procumbent. In the Banksian Herbarium, as well as in Dr. Smith's and Mr. Turner's, are preserved specimens of a *Jungermannia* from New Zealand and the Sandwich Isles, so closely allied to this, that I cannot do otherwise than mention it as a variety, and, indeed, I am unable to point out any difference, except in the ramification, which in the exotic specimens is simply pinnate, and in that respect approaches in its mode of branching to *Hypnum Crista-castrensis*, infinitely more so than *J. tomentella* does, as observed by Weis.

Dillenius justly says, when speaking of the figure of this species in Vaillant, "*nec ramos nec folia et eorum villum benè representat*:" indeed, it bears a much nearer resemblance to *J. fucoides* of Swartz's *Flora Indiæ Occidentalis*, than to our species. It was reserved for the author of the *Historia Muscorum*, to represent with great correctness this interesting plant, and his description is scarcely less accurate. "*Rami secundarii*," he observes "*nervos tenues habent et foliolis frequentissimis vestiuntur, primarii verò, seu caules, pro plantæ ratione crassi sunt*."

(*J. tomentella*.)

BRITISH JUNGERMANNIÆ.

foliis non æquè crebris cincti supernè et per margines, infernè autem geniculati sunt, foliis latiusculis villosis, quibus humi figitur, tecti." Here Dillenius considers the stipule as a kind of leaf; but I can by no means agree with him in supposing that, by help of that part, the plant is affixed to the ground, though it is probable that roots are produced immediately from its base, by which the plant may be attached to the soil, or to other individuals of its own species.

Ehrhart, in his *Beiträge*, first applied to this species the appropriate name of *tomentella*, and described it with his usual perspicuity. Weis, on the contrary, Weber, Hudson, Withering, and even Lamarck, in his *Encyclopedie*, have confounded it with the true *J. ciliaris*.

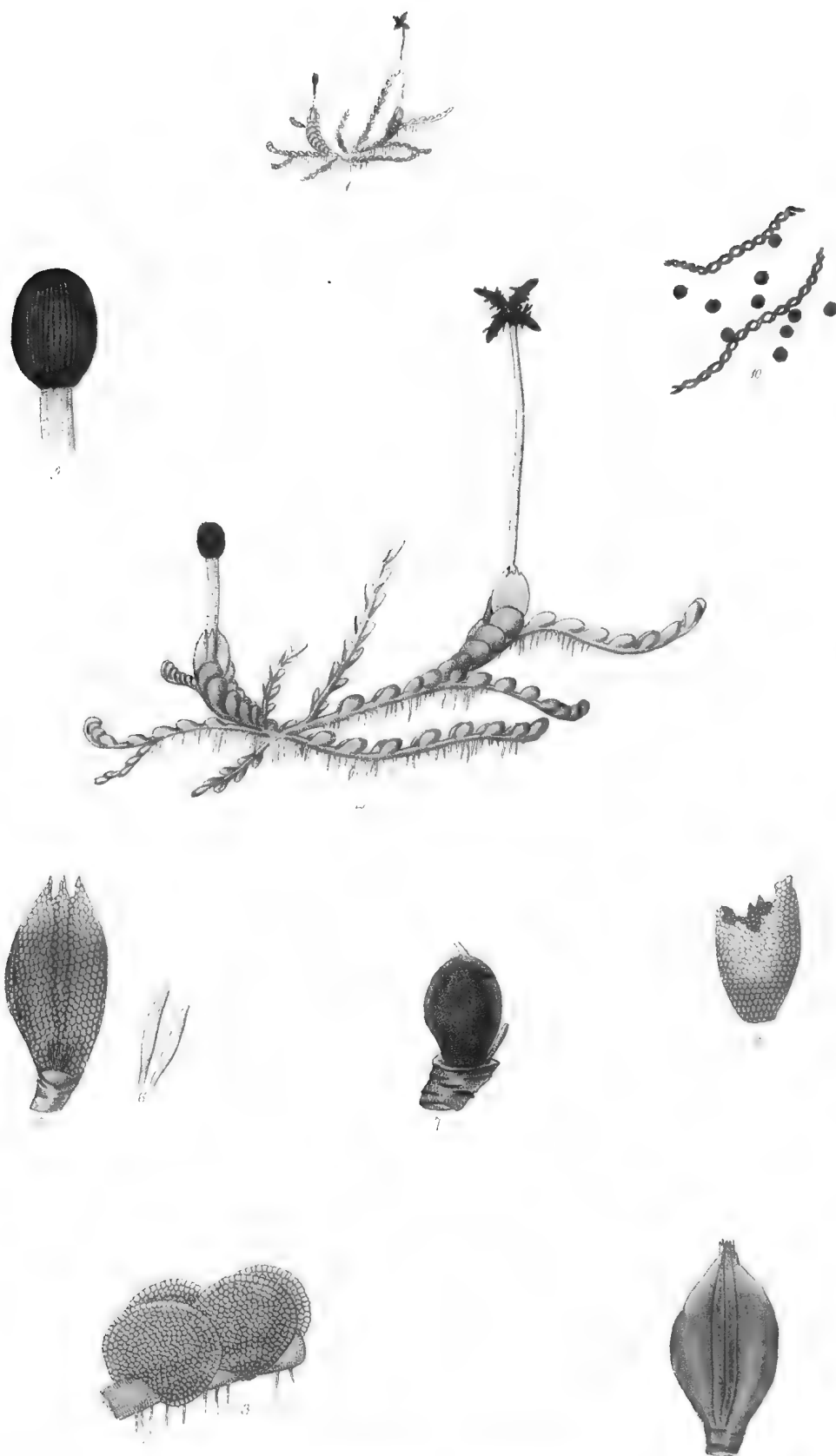
The older Botanists called this plant *Muscus Absinthii folio*; but a more striking comparison would have been with the leaves of the *Ceratophyllum*. Tournefort adds, "insipidus," while Dillenius remarks, "insipidus non est hic Muscus, sed subacris non tamen amarus." To me, however, it appears to be tasteless, or at most to have only a flavor, which it might imbibe from the earth.

The fructification represented on the plate was drawn from the specimens in the Linnæan Herbarium.

REFERENCES TO THE PLATE.

FIG.

1. *J. tomentella*, natural size.
 2. A female plant of the same, natural size.
 3. Portion of the stem and branches, seen from beneath, magnified. 6
 4. A leaf and stipule 3
 5. Calyx and capsule 3
 6. Calyx, longitudinally dissected, with the young capsule, footstalk, and its bulb 3
 7. Perichætal leaves. 2
 8. Seeds and spiral filaments 1
-



Jungermannia crenulata
Hypozia crenulata (Sm.) Dum
 var. *gracillima* (Sm.) Heeg

JUNGERMANNIA CRENULATA.

(TAB. XXXVII.)

JUNGERMANNIA, caule procumbente, ramoso: foliis rotundatis, marginatis: fructu terminali; calycibus obovatis, compressis, longitudinalitèr quadrangularibus; ore contracto, dentato.

Jungermannia crenulata. Engl. Bot. t. 1463.

β. GRACILLIMA; caulibus gracilescentibus; foliis minutis, distantibus.

Jungermannia gracillima. Engl. Bot. t. 2238.

HAB. Bogs at Amberley, Sussex. *Mr. W. Borrer, Jun.*—On the boggy parts of Holt Heath, Norfolk, abounding among *Conferva Ericetorum*. *Rev. R. B. Francis*—Near Bantry. *Miss Hutchins.*—At Howth and Powers-court, Ireland. *Dr. Stokes.*—Plentiful in the New Forest, Hants; and at Kinnordy, Kerrie-muir, Scotland. *Mr. Lyell.*—Epping Forest. *Mr. E. Forster.*—Mountains in Scotland. *Mr. George Donn.*—About Edinburgh. *Mr. Shuter.*—On wet parts of Lound and Westleton Heaths, Suffolk.—(The male fructification has been detected by *Mr. Lyell* in the month of July.—The female is found in perfection in the early spring months.)—β is not uncommon, growing with α. —*Mr. Lyell* finds it in great plenty in the New Forest; and *Mr. Francis* upon a loamy soil in Edgefield Wood, and by the road sides in its vicinity.—(Young fructification is tolerably plentiful in the months of October and November.)

This PLANT* grows in rather densely-matted patches of various, but generally considerable, extent.

Roots simple whitish fibres, which descend here and there from nearly the whole length of the under surface of the plant.

Stems from an inch to nearly three-quarters of an inch in length, filiform, somewhat flexuose, rarely simple, mostly once or twice irregularly divided, with rather slender and simple branches, which gradually lessen towards the extremity. Innovations also resembling these, but still more slender, are frequently produced. The texture of all of

* Fertile specimens seem to be the most crowded in their mode of growth, and I possess, from *Mr. Lyell*, a tuft, which forms almost an entire mass of calyces.

them is tender, and composed of numerous *cellules*, which are readily distinguishable with the microscope. The *color* is a dull green, at the apices frequently purple.

Leaves (f. 3) by no means closely placed in the barren shoots, but crowded and imbricated in the fertile ones; in the former they are considerably smallest; in the latter the upper ones, which are the largest of all, are nearly half a line in length in many instances, erect, gradually lessening as they recede from the calyx; the rest, on the contrary, become smaller in proportion as they approach the extremity, and are generally patent; all of them are of a nearly orbicular figure (the lesser ones sometimes inclining to ovate), concave, with the margins usually plane. Their *texture* is somewhat carnose; the *cellules* are small, roundish, except at the margin, where they are of a much larger size, regularly quadrate, forming a curious and very conspicuous border, which is still more remarkable in a dry state, when it becomes a little recurved, and is distinguishable by that circumstance, and by a somewhat paler color, even with the naked eye. The extreme edge of each of the marginal *cellules* is often swollen, thus forming the segment of a circle, which, of course, gives the leaf a crenulated appearance; whence the name adopted by Dr. Smith. This is, however, by no means universally so, nor have I ever seen the leaf altogether so much crenulated as the figure in *English Botany* represents it to be. The border itself is not unfrequently very obscure in the younger leaves, and in none so evident as in those upon the fertile shoots. The *color* of the leaves is extremely variable. I possess specimens, gathered by Mr. Lyell, which are wholly green, but the most usual hue is a dull olive, with the extremities often, and the terminal leaves generally, altogether of a rather deep purple.

The *Perigonal leaves* resemble the rest, except that they are more crowded and their base is swollen for the reception of the anthers. They are situated in various parts, but most frequently about the middle of the stem.

Perichætal leaves differ in no respect from the rest that are placed upon the fertile part of the stem. When the calyx is young they form a sort of cup around its base, and when that part has reached its full size, they are about half its length or more, and are closely appressed to each side of it. They sometimes appear to have their origin from the lower part of the calyx itself, but this is by no means constant: for the calyx and perichætal leaves will often be found to have one common point of insertion, at the extremity of the stem.

MALE FRUCTIFICATION situated in the axillæ of the perigonal leaves, in clusters, consisting of two or three, or more, *anthers*, each of which is spherical and reticulated, and supported upon a short, whitish footstalk.

FEMALE FRUCTIFICATION terminal* upon the main stems.

The *Calyx* (f. 5) is three-quarters of a line or more in length, of an obovate figure, laterally compressed, and furnished with four longitudinal angles, which, in the full-grown calyx, are prominent and acute, but in the younger state far less evident and obtuse; at which time, also, the whole calyx is more spherical, and may readily be

* Unless, indeed, as may happen with almost every species of the genus, the production of a shoot immediately beneath should give it the appearance of being lateral. This seemingly lateral situation may be more readily distinguished from a truly lateral one, in consequence of the much larger calycine leaves, on the upper part of the main stem.

BRITISH JUNGERMANNIÆ.

(*J. crenulata*.)

supposed, by those who have not the opportunity of tracing it to perfection, to belong to a different species. The mouth is much contracted and sometimes even prominent, always irregularly toothed. The *color* and *texture* correspond with those of the leaves.

Calyptra (f. 8) thin, delicate, of a pale yellowish-brown color, elegantly reticulated, and terminated by a short *style*.

Peduncle half an inch or more in length, white, pellucid, cellulose.

Capsule (f. 9) ovate, approaching to spherical, of a deep, shining brown color, longitudinally and transversely furrowed.

Seeds and *spiral filaments* (f. 10) of a fulvous color; the latter are formed of a double *helix*, and adhere, after the discharge of the seeds, to the margins of the valves of the capsule: the former are spherical.

The var. β , *J. gracillima* of *Engl. Bot.* is smaller in all its parts than α ; the stems, too, are more lengthened and slender, and are furnished with very minute, distantly-placed, and more ovate leaves, at least on the barren shoots; for the fertile ones differ in no respect from those of α ; like them, too, being very distinctly bordered with large, quadrate cellules, whilst in the rest this appearance is far less observable.

The present species, which belongs to that division which may be called "*Exstipulatæ, foliis distichis, integris*," is at once to be distinguished from the rest of the same tribe, by its quadrangular calyx, and its curiously marginated leaves. In some of these, however, as has been already remarked, especially of the var. β , the border is obscure, and they then bear no small affinity to those of *J. scalaris*, from which, at the same time, the want of stipules will always keep the plant distinct, even should the fructification be wanting, which is totally different in the two species in question. Leaves of the kind just mentioned have some resemblance in figure to those of *J. pumila* and *J. lanceolata*, but, besides that these last are always of a more delicate texture, their far greater size, in proportion to the diameter of the stem, and their more crowded mode of growth, will prevent them from being mistaken for those of *J. crenulata*. As I am not aware that there is any other species that is at all likely to be confounded with the present, it will be unnecessary for me to say more on its specific characters. With regard to *J. gracillima* of *English Botany*, the sterile plants have a very peculiar appearance; but the true mark of the species will be found in the fertile shoots, and I am particularly happy to be able to add, that Mr. Lyell, who has been at great pains in examining and comparing the two, and long thought them distinct, now perfectly coincides with me in considering them merely as varieties of each other. β may often be found with α , as well the intermediate states of the two.

Boggy places in various parts of the united kingdom produce this pretty plant. Mr. Francis has for many years remarked it in the neighborhood of his residence; but Mr. Borrer's specimens, found in Sussex, are those that have been first published. These grow to a larger size than the Norfolk plant. No author but Dr. Smith has noticed the species; nor, indeed, does it appear to be an inhabitant of the continent.

REFERENCES

(*J. crenulata*.)

BRITISH JUNGERMANNIÆ.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. crenulata</i> , natural size.	
2. <i>The same</i> , magnified	6
3. <i>Portion of a surculus with leaves</i>	4
4. <i>Calyx</i>	3
5. <i>Section of the same</i>	3
6. <i>Barren pistilla</i>	1
7. <i>Germen</i>	2
8. <i>Calyptra</i>	2
9. <i>Capsule</i>	3
10. <i>Seeds and spiral filaments</i>	1





Jungermannia inflata.
Huds. bot. ...

JUNGERMANNIA INFLATA.

(TAB. XXXVIII.)

JUNGERMANNIA, caule procumbente, simplice, vel ramoso: foliis subrotundis, concavis, acutè bifidis; segmentis rectis, obtusis: fructu terminali; calycibus pyriformibus; ore contracto, dentato.

Jungermannia inflata. HUDS. *Angl.* p. 511.

Jungermannia bicrenata. SCHMIDEL, *Icones*. p. 246. t. 64. f. 1. (*excl. syn.* DILL.)

Jungermannia bidentata. var. 2. WITH. III. p. 853.

HAB. Moist and frequently boggy places in various parts of England, Scotland, and Ireland. In Sussex it abounds on the chalky downs.—(*Mr. Lyell* finds the anthers in July, in the New Forest, Hants.—Calyces are found during the greater part of the year; but capsules have been met with only by *Miss Hutchins* and *Dr. Taylor* in Ireland during the early spring months, and by *Mr. Lyell* in the New Forest, in July, and again on the ninth of January, 1813.)

PLANT growing in very densely-matted patches of considerable extent, conspicuous from their deep green or almost black color.

Root consisting of numerous, minute, short, whitish and simple fibres, thrown out here and there from the greater part of the under side of the plant.

Stems from a quarter to half an inch, or rather more, in length, procumbent, slender, filiform, flexuose, simple, or, as is frequently the case, bearing two or three simple scattered ramuli, which are either, like the parent stem, procumbent (f. 4), or erect (f. 5), when the plant grows among grass or moss. The *color* varies from a pale green to an olive brown. The *texture* is rather firm, composed of oblong *cellules*. Innovations are now and then found arising from various parts of the stem, which much resemble the smaller branches.

(*J. inflata*.)

BRITISH JUNGERMANNIÆ.

Leaves (f. 6) more or less closely placed* in a bifarious manner, generally most distant in the lower part of the plant; the upper ones somewhat imbricated, horizontal, patent or even erect, frequently concave, occasionally remarkably so (see f. 7), sometimes also plane or recurved; they are divided for nearly one half (or rather less) of the way down from the apex, by an acute sinus, into two obtuse and strait segments. The *cellules* are small, roundish. The *color* varies from a pale yellow-green (if the plant grow in a much sheltered spot) to an olive-green, or a brownish-black.

Perigonal leaves produced at the extremity of the plant, where they are closely imbricated and ventricose at the base. In other respects they exactly resemble the rest.

Perichatial leaves remarkable in being smaller than the other leaves, which they otherwise resemble. Two or three of them closely embrace the base of the calyx.

MALE FRUCTIFICATION†. *Anthers* are found in the axillæ of the perigonal leaves, of a spherical form, of a pale olive-green color, reticulated, supported upon a footstalk, which is transversely striated, and about equal in length to the anther.

FEMALE FRUCTIFICATION terminal, though occasionally appearing lateral from the peculiar insertion of an innovation.

Calyx large in proportion to the size of the plant, half or three-quarters of a line long, at first nearly spherical, at length pyriform or obovate, with a lengthened and tapering base, above somewhat plicate; its *mouth* much contracted, and cut into a few obtuse and unequally-sized teeth.

Pistilla (f. 10) eight or ten in each calyx, short, lanceolate, obtuse, of a greyish color, longitudinally and transversely striated.

Calyptra ovate, reticulated, whitish, tipped with a short *style*.

Peduncle from two to three or even four lines in length, cellulose; terminated by the brown, ovate

Capsule, which is exteriorly slightly furrowed, and opens into four equal, or (according to Schmidel) three, variously jagged, valves.

Seeds and *spiral filaments* of a fulvous brown color‡; the former spherical; the latter composed of a double *helix*, and continuing attached to the margins of the valves in a pectinated manner, as well as to the centre of the capsule in a pencil or tuft§.

As the learned author of the *Icones* has alone been so fortunate as to discover *gemmæ* upon this plant, I shall offer no apology for transcribing his account of them, in order to render my description the more complete. “Sunt dein aliæ frondes, quas Novembri mense potissimum deprehendi, ante quam aut flosculi erumpunt, aut pauciores saltem pullulant; quæ semper denso foliorum ordine imbricatæ sunt. In his copiosè, ad interioris plerorumque foliorum

* Upon the innovations they appear to be always very distantly placed, and smaller than the rest.

† I have only become acquainted with the male fructification since the engraving was completed.

‡ Schmidel says they are sometimes mixed with white. “Vasculum recentè ruptum, magnam copiam pulveris continet ex fulvo fusci intensissimi, sphaerici, qui cohæret filis tenerrimis, serpentinò ductu crispatis, nigricantibus, aut interdum albo mixtis, inordinatim positis.” *Icones*, p. 249.

§ Schmidel, *Icones*, p. 249. “Si vasculum rumpitur, magno cum impetu ejicitur pulvis: circa centrum vasculi vero maxima pars filorum s. funiculorum, eo excusso, adhuc restat penicilli divergentis formâ, et disco valvularum etiam, pars eorum sparsim adhæret. Tandem omnia dejiciuntur, et sola testa restat valvularum. Postremo pedunculus marcescit, et declinans procumbit, ex quo calix in medio fovea impressa desedit.”

dentis apicem, glomerulus, intensè rufus conspicitur, qui initio parvus, sensim major distinctè granulosus est, granulis subrotundis conflatus. Hæc granula tandem dissolvuntur, et per dentem prius defluunt, tandem per superficiem foliorum discumbunt sub forma punctorum rubicundorum. Unde hæc granula oriantur, distinguere nondum potui. Interdum vesiculæ foliorum contiguæ et vicinæ granulis, vel marginales, ex parte eodem rubore perfunduntur, qui in granulis conspicitur. Interdum in ipsis frondibus flosculiferis, in aliquot foliolis supremis, idem hoc ultimum distinxi *."

To our countryman, Mr. Hudson, is due the credit of first distinguishing the present plant, which has consequently long been published, though no other author since his time seems to have spoken of it of his own knowledge, except Schmidel, who, in the place above quoted, has given a figure as admirable as is his description. From the former of these, not being myself, at the time the plate was in hand, acquainted with the perfect capsule, I have copied the representation given at f. 4. Of the species in question being the *inflata* of Hudson I can speak with certainty, having had the opportunity of comparing it with his original specimens, and being also furnished with others, which Dr. Swartz gathered in England, when in company with its discoverer. In Germany, according to Schmidel, this plant seems to be not uncommon, and in Sweden it is no less abundant than it is in Britain. Dr. Swartz informs me that it grows amid the exhalations arising from the copper-mines at Fahlun. "E collibus excelsis," he writes upon the cover of one of the numerous specimens that he has communicated to me, "cuprifodiam Fahlunensem adjacentibus, ubi Flora pauperrima ob exhalationes metalli fusi.—Nulla alia sui generis ibi invenitur quàm hæc quâ in declivis uliginosis supra terram crescit." In this situation *J. inflata* seems to flourish, though it is destitute of fructification.

The singular form of the full-grown calyx of this plant, and the obtuse segments of the leaves, together with the deep olive or almost black color, are marks by which *J. inflata* may be known from every other: and after the accurate character given of it by Hudson, and the elaborate description and figure by Schmidel, it is not a little remarkable that Roth should suppose it could possibly be a variety of *J. incisa*! His words are "Huic (*J. incisæ*) proximè accedit, nisi eadem sit, *J. bicrenata*, Schm. Habitus totius plantæ sanè idem cum nostrâ, quamvis folia constanter bisecta dicantur, quæ in nostræ regionis plantis nunc bi-nunc et plerumque trifida observantur." *Fl. Germ.* III. p. 382. Withering, too, has fallen into an error no less striking, since he has made it his *var.* 2 of *J. bidentata* (our *J. heterophylla*). To this mistake he was probably led by Schmidel's quoting erroneously (though he has done it doubtfully) the Dillenian species, t. 60. f. 12.

Schmidel has noticed more than one fertile germen within the calyx, a peculiarity that is not confined to this species. I have remarked it in *J. emarginata* (see t. XXVII.) and in *J. reptans*.

The fructification of *J. inflata*, in a perfect state, seems to be very rare, but the calyces are extremely abundant; and these, like the sterile calyces of *J. ventricosa*, are broken off with the slightest touch.

* A variety of *Jungermannia excisa* has lately been found by my friend, Mr. Francis, having gemmæ so like those that are here described by Schmidel, that, were it not for the established accuracy of that author, I should almost be led to suppose that he may have confounded the two. The color of the foliage in both is very similar.

(*J. inflata*.)

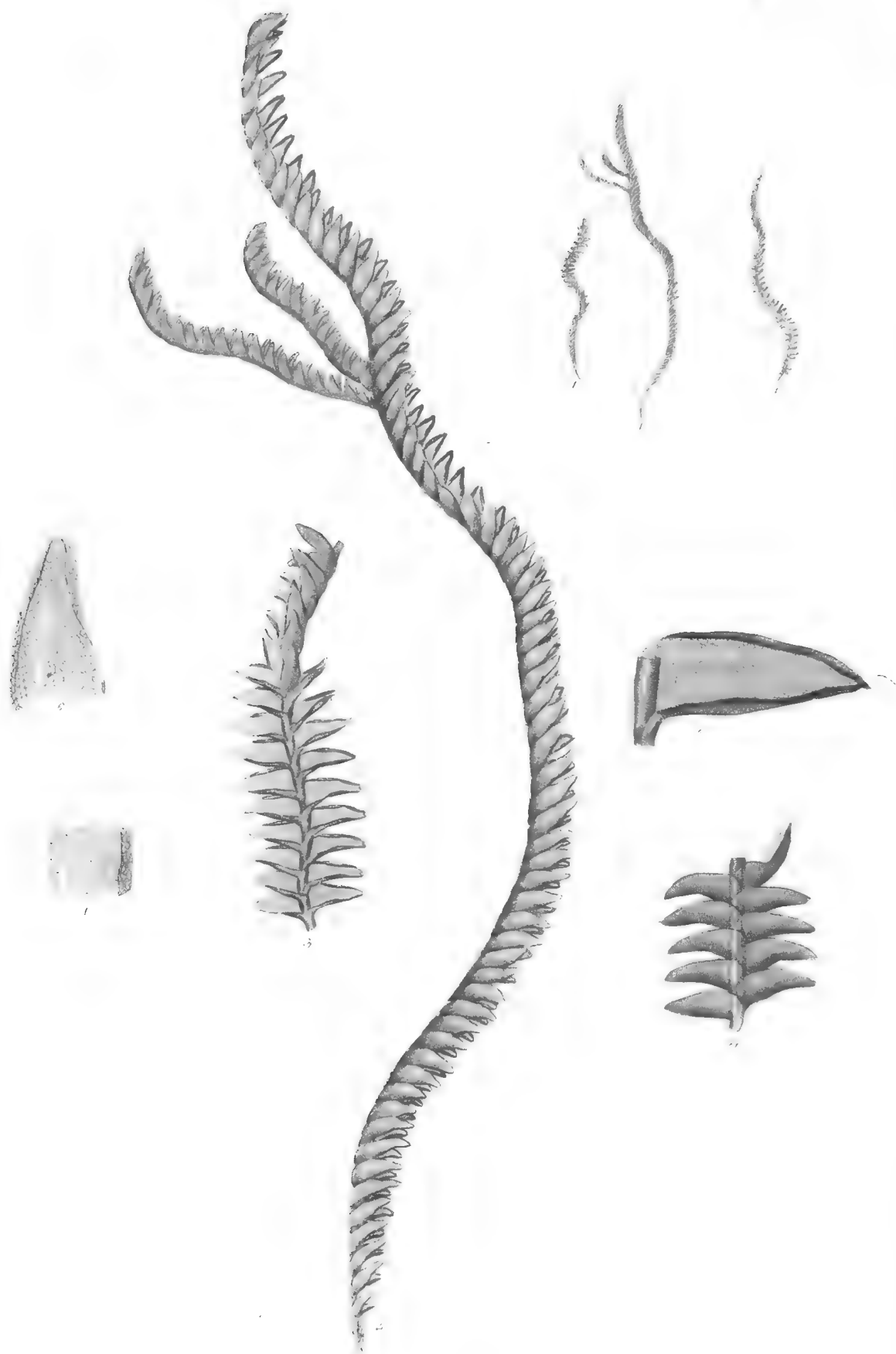
BRITISH JUNGERMANNIÆ

REFERENCES TO THE PLATE.

FIG.

1, 2, 3. <i>J. inflata</i> , natural size.	
4. Fertile plants, magnified	6
5. Barren plant	6
6, 7. Leaves	4
8. Apex of a stem and a calyx	4
9. Section of the calyx	3
10. Barren pistilla	1
11. Capsule	2





Jungermannia Lonniana.
Chlorophyton Lonianum Linn.

JUNGERMANNIA DONNIANA.

(TAB. XXXIX.)

JUNGERMANNIA, caule erecto, subsimplice, filiformi, flexuoso: foliis arctè imbricatis, subhorizontalibus, oblongo-ovatis, concavis, apice bidentatis, falcato-secundis.

HAB. Discovered by *Mr. George Donn*, in 1795, upon the highest mountains of Clova, in Angus-shire, and on Ben Lawers and Ben Nevis; again found in 1802, on Cairngorum, and in September, 1802, on Ben-na-bord and Ben-Mac-Davie, two mountains North of the Dee.

PLANT growing in rather small and loosely-entangled tufts, intermixed with other species of *Jungermannia* and Mosses.

Of the *roots*, I have not been able to find any traces, and, indeed, the lower part of the plants (whence, probably, the roots originate) are so much matted together, and so brittle, that it is scarcely possible to separate an entire individual from the tuft. *Stems* from one to two or even nearly three inches in length, and about the thickness of horse-hair, erect, filiform, flexuose, of a rigid, and, in a dry state, fragile nature, somewhat ligneous, opaque, exhibiting no cellular texture, of a purplish-brown color, often verging to a black, either simple, or occasionally interrupted by one or two scattered young shoots, which, except in size, differ in no respect from the parent stem.

Leaves (f. f. 3. 4. 5) closely imbricated in a bifarious manner over the posterior surface of the stem, and with great regularity throughout its whole length, about half a line long, of an oblongo-ovate figure, very concave, having the sides not unfrequently incurved; at the base they are slightly decurrent; at the apex divided by an acute sinus, which is often concealed by the involute margin of the extremity (see f. 5), into two small, and rather obtuse teeth; with regard to position, they are nearly horizontal, slightly falcate, sometimes distichous, (f. f. 3. 4) but far more generally

(*J. Donniana*.)

BRITISH JUNGERMANNIÆ.

falcato-secund (f. 2). The *texture* of the leaf is rather firm, brittle when dry: the *cellules* are very compact, extremely small, ovate or oblong, and may often be observed to be arranged in longitudinal series; many of the *cellules* are opaque, whilst others are semi-pellucid, as is represented at f. 6. Their *color* is rather a deep, purplish-brown; at the base of the plant, of a dirty hue.

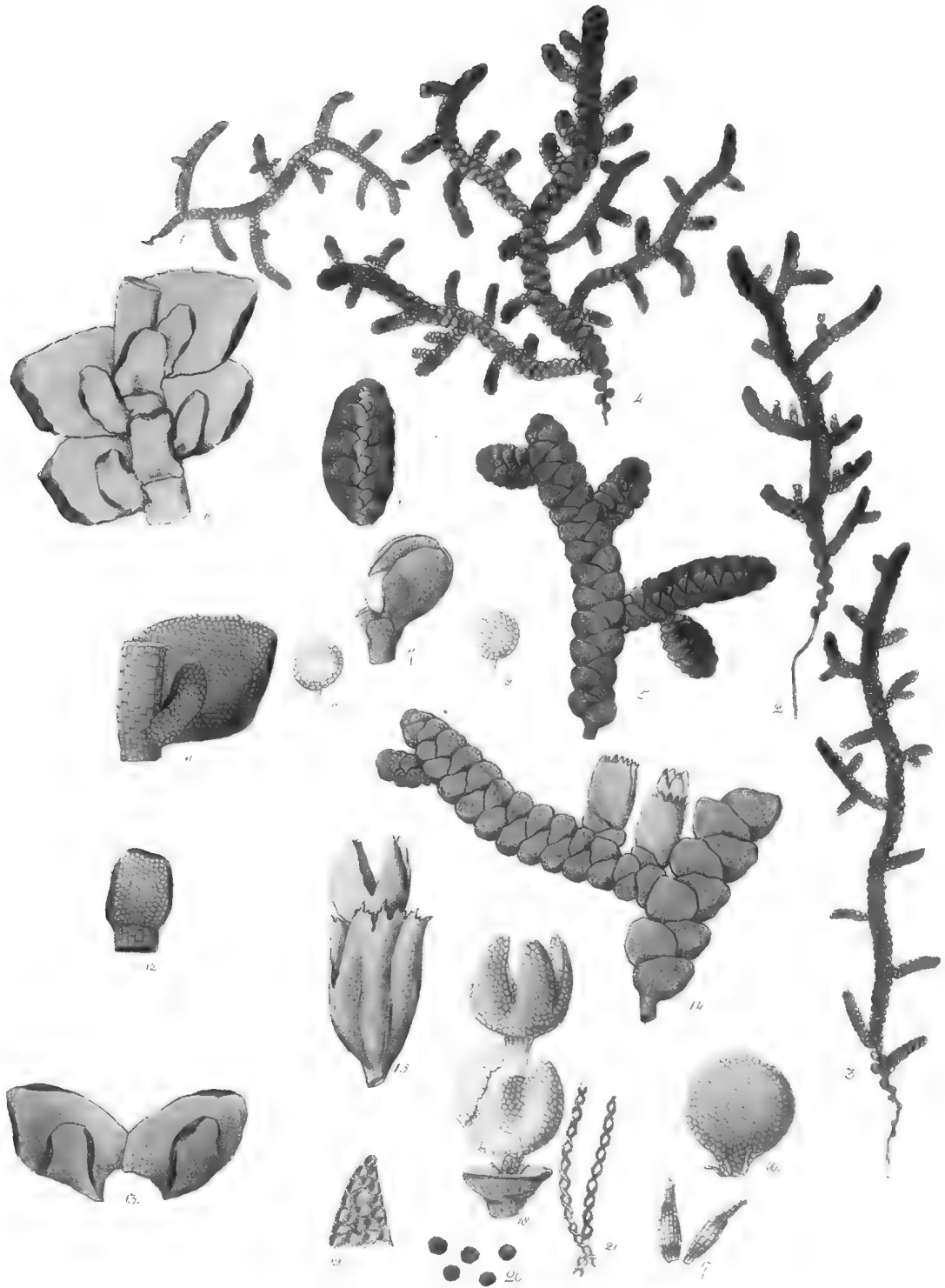
Mr. George Donn, of Forfar, communicated specimens of this plant, which he gathered in 1795, both in the Clova and the Breadalbane mountains, to Dr. Smith, a few years since, marked "*J. adunca* of Dickson (the *J. juniperina* of Swartz and this work). On its being ascertained to be a new species, my kind friend, Mr. Lyell, applied to Mr. Donn for other specimens, which he had been so fortunate as to gather on another of the Scotch mountains, in 1802, and he has subsequently informed me of two new stations for this plant, detected in September, 1813. It is a species the most distinct of any I am acquainted with, and, among the British Jungermanniæ, is perfectly "*sui generis*;" though, in mode of growth, and in the disposition of the leaves, some kind of affinity may be observed with *J. juniperina*. In the shape of the leaves, as well as in their direction, it bears a nearer approach to a large, and, I believe, undescribed species found at St. Helena; but, besides the much smaller size of the former, the color of the two are totally different. Of our present plant, unfortunately, no fructification has yet been met with. It appears to be confined to a few of the loftiest of the highland mountains, and, even in these situations, has only been seen by its discoverer, whose name it bears, and who has contributed so much by his indefatigable industry to the Flora of the British Isles.

REFERENCES TO THE FIGURE.

FIG.

1.	<i>Plants of J. Donniana, natural size.</i>	
2.	<i>An individual magnified</i>	6
3.	<i>Portion of the same, seen on the anterior surface</i>	4
4.	<i>The same, seen on its posterior surface</i>	4
5.	<i>A leaf</i>	3
6.	<i>Portion of ditto</i>	2
7.	<i>Smaller portion of ditto</i>	1





Jungermannia platyphylla
Madotheca platyphylla.

JUNGERMANNIA PLATYPHYLLA.

(TAB. XL.)

JUNGERMANNIA, surculo procumbente, pinnatim ramoso: foliis bifariis, inæqualitèr bilobis; lobis superioribus majoribus, rotundato-ovatis, subintegerrimis; inferioribus stipulisque ligulatis, planiusculis, integerrimis: fructu laterali; calycibus subovatis, compressis, ore truncato, inciso-serrato, hinc longitudinalitèr semibifidis.

- Jungermannia platyphylla*. LINN. *Sp. Pl.* II. p. 1600. *Syst. Nat.* II. p. 706. GOUAN, *Monsp.* p. 452. POLLICH, *Pal.* III. p. 196. LEERS, *Herb.* p. 251. WEIS, *Plant. Crypt.* p. 125. WILLD. *Ber.* p. 342. OEDER, *Enum. Pl. Fl. Dan.* p. 42. ALLIONI, *Fl. Ped.* II. p. 314. VILLARS, *Delph.* III. p. 926. ROTH, *Germ.* III. p. 405. HOFFMANN, *Germ.* II. p. 87. HUDS. *Angl.* p. 515. LIGHTF. *Scot.* II. p. 784. LINN. *Syst. Nat. ed. Gmel.* II. p. 1351. WITH. III. p. 861. LAMARCK, *Fl. Fr. ed. 2.* II. p. 433. RELHAN, *Cant.* p. 439. *Engl. Bot.* t. 798.
- Jungermannia cupressiformis*, β . LAMARCK, *Encycl. Method.* III. p. 383.
- Muscoides squamosum, majus, atro-virens, foliis subrotundis*. MICHELI, *Nov. Gen.* p. 9. t. 6. f. 3.
- Muscoides squamosum medium, rotundifolium, atro-virens*. MICHELI, *Nov. Gen.* p. 10. t. 6. f. 4.
- Hepaticoides foliis subrotundis, squamatim incumbentibus, major*. VAILLANT, *Bot. Par.* p. 100. n. 5. t. 19. f. 9.
- Jungermannia foliis subrotundis, densissimè, et imbricatim dispositis, viridis, minor*. RUPP. *Jen.* I. p. 345. II. p. 294. (fide Dill.)
- Lichenastrum arboris Vitæ facie, foliis minùs rotundis*. DILL. *Musc.* t. 72. f. 32.
- Jungermannia foliis imbricatis, lanceolatis, supernè planis alternis, infernè concavis, quinquefariis*. HALL. *Helv.* III. p. 61. n. 1872.

β . (f. 4) MAJOR; surculo (ut in α) vagè bipinnatim ramoso; foliis majoribus, lævigatis, flavo-virescentibus.

γ . (f. f. 2. 3) THUJA; surculo elongato, simpliciter pinnatim ramoso; foliis lævigatis, fuscescentibus.

Jungermannia Thuja. DICKS. *Plant. Crypt. Fasc.* 4. p. 19.

Jungermannia platyphylla, β . WEIS, *Plant. Crypt.* p. 126. WITH. III. p. 861.

Jungermannia cupressiformis, γ . LAMARCK, *Encycl.* III. p. 283.

(*J. platyphylla*.)

BRITISH JUNGERMANNIÆ.

Muscoides squamosum, saxatile, maximum, compressum, ex obscuro virescens, foliis subrotundis non nihil denticulatis. MICHELI, Nov. Gen. p. 9. t. 6. f. 1.

Lichenastrum Arboris Vitæ facie, foliis rotundioribus. DILL. Musc. t. 72. f. 33.

Jungermannia, foliis imbricatis, lanceolatis, supernè planis, alternis, infernè concavis, quinquefariis. HALL. Helv. III. p. 61. n. 1872. var. β .

HAB.— α is extremely abundant upon old walls, rocks, and even on the trunks of trees, in various parts of the kingdom; flourishing within the influence of the smoke of large towns.— β has hitherto been found only in Ireland, by Miss Hutchins, upon stones by the side of Gougan Barra Lake, among the mountains near Bantry.— γ was first discovered in this country by Mr. Archibald Menzies, in August, 1778, growing upon trees on the North side of Loch Ness, in Scotland.—It has since been gathered by Mr. Templeton, on moist rocks, by the side of a waterfall, near Carrifergus, in Ireland.—(Upon α the female fructification is produced in March and April; but some of Mr. Menzies' specimens of the β , which he has been so good as to furnish me with, contain perfect capsules, gathered in August.—Mr. Lyell has detected the male fructification in the month of March.)

This PLANT grows in considerable patches, with every individual imbricating each other, as is the case with *J. Hutchinsia*; or, to use the words of Dillenius, "Magnis cæspitibus et numerosâ serie invicem congestis, arboribus et muris adnascitur hic muscus."

The roots are with difficulty discoverable, a few rigid, extremely brittle, and somewhat ligneous fibres, may now and then be seen to descend from the lower part of the plant. Stems from one to two and three inches in length (or even five inches, in β and γ), scarcely so thick as small packthread, very flexuose, and pinnated often with straggling branches, in some instances with much greater regularity than in others; these pinnæ are not unfrequently again divided with short and nearly horizontal simple pinnulæ. Their texture is firm, opaque, and even woody below, but, towards the extremity, the cellular texture is very visible. The color varies from a deep brown to a yellow, but dirty green.

Leaves closely imbricated in two rows, so as wholly to conceal the upper side of the stem; they are unequally two-lobed, having the upper one considerably the largest, and nearly three quarters of a line (in γ more) in length, often largest at the extremity of the branches, distichous*, alternate, horizontal, ovate, approaching to round, slightly concave above, with the margins, particularly at the apex, incurved, entire, or here and there very slightly toothed: the lower lobe or lobulus is ligulate, diagonally appressed to the inferior surface of the upper one, plane, having the margins only recurved and entire. The color of the leaves is a deep, and sometimes blackish-green, opaque, free from gloss in α ; the texture is rather compact; the cellules minute, roundish (f. 11).

* Dillenius has been very happy in his description of this species, of the leaves in particular, "foliis crebris" are his words, "imbricatim congestis, alternâ serie a dextrâ ad sinistram, a sinistrâ ad dextram impositis, tenuibus, modicè pellucidis, saturantur viridibus, aut ex fusco virentibus, apicibus et marginibus deorsum flexis, ut velut rotunda folia appareant."

BRITISH JUNGERMANNIÆ.

(*J. platyphylla*.)

Perigonal leaves (f. f. 5. 6. 7) closely imbricated upon short lateral ramuli, so as to form an ovate compact mass, not much unlike the spicula of a *Briza* (f. 6); each is smaller than one of the common leaves, and divided into nearly equal, very concave, not appressed, lobes, resembling those of *J. resupinata*, and having their margins a little involute, and altogether free from denticulation.

The *Perichætal leaves* scarcely differ from those of the stem, except that they are smaller, and that the lobule is somewhat larger in proportion to the lobe. There are two to each calyx.

Stipules (f. f. 10. 12); of these there is one to each pair of leaves, arising from the under side of the stem, and appressed to it; it is oblongo-ovate or ligulate, much resembling the lobule, and in like manner recurved and entire.

MALE FRUCTIFICATION (f. f. 5. 6) situated in the axillæ of the perigonal leaves. There is one *Anther* (f. 7) in each of them, which is large, in proportion to the size of the leaf, and presents an exterior reticulated cuticle, but within is filled with a minute greyish granulated substance. The *footstalk* is scarcely more than half the length of the anther, white, transversely striated.

FEMALE FRUCTIFICATION lateral*, arising from the under side of the pinnæ.

Calyx (f. f. 14. 15) a line or more in length, ovate, narrow and cylindrical at the base, but gradually becoming wider, at first compressed and flat, at length, for the emission of the capsule, erect, and nearly cylindrical. The *mouth* is truncate, inciso-serrate, and cut with a deep notch, on one side, which extends nearly half the length of the calyx.

Pistilla, eight or ten in number, ovato-lanceolate, of a greyish color, longitudinally and transversely marked with darker lines: the *mouth* a little expanded.

Calyptra exactly spherical, contracted at the base, which forms a kind of footstalk; it is rather carnosæ, but elegantly marked with a roundish reticulation, and terminated by a short tubular *style*.

Peduncle scarcely equal in length to the calyx, whitish, cellulose, tipped with the perfectly spherical

Capsule, of a pale yellowish-brown color (f. f. 15. 18): on bursting, which it does from the apex, the four equal valves extend no more than half the length of the capsule, and never appear to expand, but, even when old, continue erect. The *texture* of this capsule is particularly delicate, and, under a highly magnifying power, exhibits a reticulated structure, very much like that of the calyptra, but having, on the borders of the areolæ, a granulated appearance (f. 19).

Seeds (f. 20) numerous, by no means perfectly spherical, of a pale olive-brown color.

*Dillenius says it is terminal as well as lateral, which I have not observed to be the case. In other respects, his description is very characteristic. "Ab inferiori parte ex ipso nervo vaginæ oriuntur tenues membranaceæ, subvirentes, pediculo brevissimo hærentes, e ramorum extremitatibus et secundum eorum longitudinem egredientes, sursùm tendentes, in summitate ab initio inflexæ, dein rectæ, mediotenus bivalves, non angulosæ, in quibus grana latent atro-viridia, colore, ubi erumpunt, spadiceo, in flores fusco-rufescentes dehiscentia."

(*J. platyphylla*.)

BRITISH JUNGERMANNIÆ.

Spiral filaments (f. 21) fulvous, apparently enveloped in a delicate, pellucid tube; but whether or not these are affixed to the ends of the valves, or, as I rather suspect, to various parts of the interior of the capsule, I have been unable to determine.

The variety β , major, is remarkable for the size of its foliage, which is twice as large as that of α , and for its being throughout glossy: the stems are equally irregularly pinnate.

Var. γ has the stems much elongated and regularly, though distantly, pinnated with short and horizontal ramuli, that are mostly simple. The leaves gradually, at least in many instances, become less, as they approach the extremity of the plant, and are glossy, and, in all the specimens that have come under my observation, of a yellow-brown color. — The two varieties differ in no other particulars from α ; and intermediate states, even of these, shew that the marks here laid down are by no means strictly to be depended upon.

J. platyphylla, which in Britain is extremely abundant, and is said, by Dillenius, also to be a native of Virginia and Pennsylvania, is subject to considerable variation in appearance, whence some botanists have been led to form from it two species, which seem, indeed, at first sight, sufficiently distinct, yet, on a more minute investigation, it will be readily ascertained in how slight a degree a character taken from the general habit is to be depended upon. Perhaps even the *J. lævigata* of Schrader and of this work ought to be considered as a fourth variety; but as I have already, under that species, expressed my doubts, as well as pointed out the only differences that I have been able to find between them, it will be unnecessary for me here to repeat either the one or the other. There is no other Jungermannia that I am acquainted with, with which there is the least chance of *J. platyphylla* being confounded. With regard to its affinity, I am at a loss to say to which of the families it naturally belongs in the division of "*Stipulata, foliis inæqualitèr bilobis, lobis inferioribus minoribus planis*;" for, while, on the one hand, it resembles *J. tomentella* and *ciliaris* in the structure of its foliage, on the other, it greatly differs from them in its fructification; and in the short valves of the capsule agrees with a very natural family, consisting of *J. serpyllifolia*, *J. hamatifolia*, *J. calyptrifolia*, and *J. minutissima*, which in other respects it is, nevertheless, extremely unlike.

I have omitted, in the above synonyms, many references to the older botanists, which are mentioned in Dillenius and Micheli, because, from their short and imperfect characters, it is not possible to quote them with the least chance of being correct. Micheli's figures are more to be trusted than his descriptions. His representation of the ramuli, containing the male fructification, is very accurate, as is his description. The anthers, it is well known, he looked upon as the seeds, and of these he says, that they are found "*non in externâ foliorum parte, sed recondita in sinu squamarum ejusdam fructûs, qui locustarum Graminis amoris formam præ se ferens, per surculos vel per plantas non floriferas innasci solet.*" His figure of the var. *Thuja* is much larger than I have

BRITISH JUNGERMANNIÆ.

(*J. platyphylla*.)

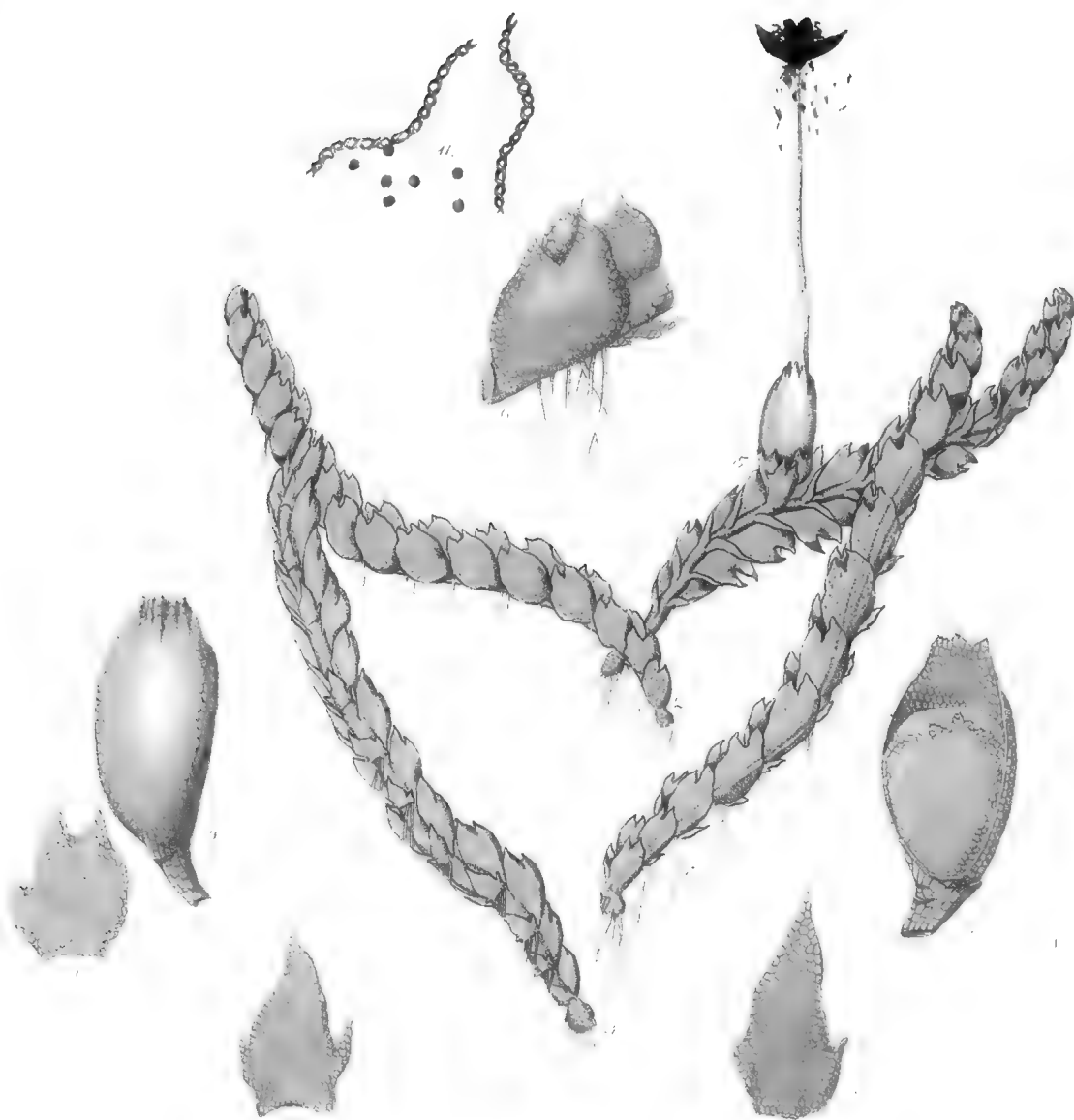
ever seen the plant, and the representations of α seem to be intermediate between that and γ . By far the most excellent account of this species is given by Dillenius, though I cannot find that the difference, mentioned by this celebrated author, in the leaves of his fig. 33 exists, even in his own specimens. Haller is by no means correct in his remark upon Micheli, where he says, "Summos ramos terminant compressæ gemmæ, *Brizæ* locustis similes, quas pro fructibus Michelius habet: veros tamen juniores ramos esse, ex foliis serratè commissis facile agnoscas:" nor is he less inaccurate, when, in speaking of the calyces, he describes them as "rotundi and bivalves". In his var. β . (our *Thuja*), he falls into the same error as Dillenius, in attributing to it cordate leaves in opposition to those of α , which he says are ovato-lanceolate. Lamarck, in the *Encyclopédie*, had united this species with his *J. cupressiformis**, making our α the β of that plant, and our var. *Thuja* the γ of it. In the *Flore Française* this excellent naturalist has restored the name *platyphylla*. The var. *Thuja*, however, is unnoticed in that work, from which, probably, we may infer that it is not a native of France.

REFERENCES TO THE PLATE.

FIG.

1.	<i>J. platyphylla</i> , natural size.	
2, 3.	Var. γ . natural size.	
4.	Var. β . natural size.	
5.	Portion of the stem and male fructification, magnified	6
6.	Male ramulus, seen from beneath	4
7.	Perigonial leaf and anther	2
8, 9.	Anthers	1
10.	Portion of the stem and leaves, seen from beneath	2
11.	Leaf	1
12.	Stipule	1
13.	Perichæatial leaves	2
14.	Female branch	6
15.	Calyx and capsule	3
16.	Germen	2
17.	Pistilla	1
18.	Calyptra and capsule	2
19.	Apex of a capsule	1
20.	Seeds	1
21.	Spiral filaments	1

* *J. dilatata*, auct.



Jungermannia stipulacea.
Harporanthus scutatus (Nob et Mohr) Spruce

JUNGERMANNIA STIPULACEA.

(TAB. XLI.)

JUNGERMANNIA, caule procumbente, simplice: foliis rotundatis, apice emarginatis, sinu segmentisque acutis, rectis: stipulis magnis, ovatis, acuminatis, prope basin margine utrinque unidentato: fructu laterali; calycibus obovatis, apice subplicatis; ore contracto obtusè dentato.

HAB. Shady rock in Laharn wood, near Bantry, Ireland. *Miss Hutchins.*—Found afterwards at Lough Bray, by *Dr. Taylor*; and in Scotland, by *Mr. George Donn*.

PLANT growing in dense, very compact tufts, or cushion-like patches, resembling those of *J. incisa*.

Roots descending in small bundles from the whole length of the under side of the stems, each bundle originating immediately beneath the stipules: most abundantly towards the base of the plant. Every individual radicle is simple, whitish, and pellucid.

Stems procumbent, or occasionally nearly erect, scarcely exceeding a quarter of an inch in length, and not more than the fifteenth of a line in diameter, a little flexuose, filiform, or slightly tapering from the base towards the extremity, almost always simple, though I have observed them, in one or two instances, producing young shoots. Their *color* is a yellowish-green, inclining below to a brown. The *cellules* are tolerably conspicuous under the microscope.

Leaves (f. 6) bifarious, smallest at the base, gradually becoming larger towards the middle, where they are three-tenths of a line long, but thence diminishing to the apex; they are rather closely placed, and slightly imbricate each other, sometimes patent or horizontal, but by far more frequently erect, slightly concave on the upper surface, and convex beneath, a little waved, of a roundish figure, cut at the apex into a rather deep and acute notch or sinus, of which the segments are likewise sharp and strait. The *texture* is thin and somewhat membranous, the *cellules* small, roundish. The *color* a pale green, with more or less of a yellow tinge.

The *stipules* (f. 8), which are very large, when compared with the size of the plant, are ovate, acuminate, plane or but little waved, a little patent or standing out from the stem: the margin entire, except near the base, where it is furnished with a single tooth, which is, however, occasionally nearly obsolete. They are of a more delicate texture than the leaves, but, in the *cellules* and *color*, exactly resemble them.

(*J. stipulacea*.)

BRITISH JUNGERMANNIÆ.

Perichatral leaves small: two or three of them surround the base of the calyx. Each is roundish, and cut into three unequal and acute segments at the extremity.

MALE FRUCTIFICATION unknown.

FEMALE FRUCTIFICATION (f. 5) lateral; at least, it is so in the only fertile specimen that has come under my notice.

The *Calyx* (f. f. 9. 10) is obovate, of the same *color* and *texture* as the leaves, slightly plicate towards the extremity, where it is a little attenuated. The *mouth* is contracted, plicate, obtusely toothed.

The *Calyptra* (f. 10) appears to be equal in width, and even to adhere to the sides of the calyx, of which it is about three-fourths of the length; the upper part only is detached, and is membranous, whitish, and reticulated.

Peduncle two or three lines long, white, cellulose.

Capsule ovate, deep brown, striated longitudinally and transversely.

Seeds and *spiral filaments* (f. 11) reddish-brown; the former spherical, the latter formed of a double *helix*.

This little species has been detected both in Ireland and in Scotland. Its minute size may have caused it to be overlooked in other parts of the kingdom, but this peculiarity, together with its large stipules, and the prominent situation of these, and their figure, afford striking characters; though, in the latter particular, it very nearly corresponds with another new species (*J. Bantricensis*, mss.) which has lately been discovered by Miss Hutchins, and which has, like the present, emarginate leaves: but it differs in its much greater dimensions, in the less concave, obtusely and slightly emarginate leaves, in the small stipules, and in the situation of the calyx, rising quite leafless at the base from the upper side of the stem, as that of *J. pusilla* does. I must here mention another species, found in Scotland by Mr. Lyell, which has considerable affinity with the present in the size of the stipules, and still more so in their form: but, besides that its leaves are twice or thrice as large as those of *J. stipulacea*, they afford a more decisive character in their obtuse segments. With the two plants now mentioned, *J. stipulacea* will undoubtedly range. They all differ from *J. bidentata* and *J. heterophylla*, in having entire stipules; while these have them deeply divided.

BRITISH JUNGERMANNIÆ.

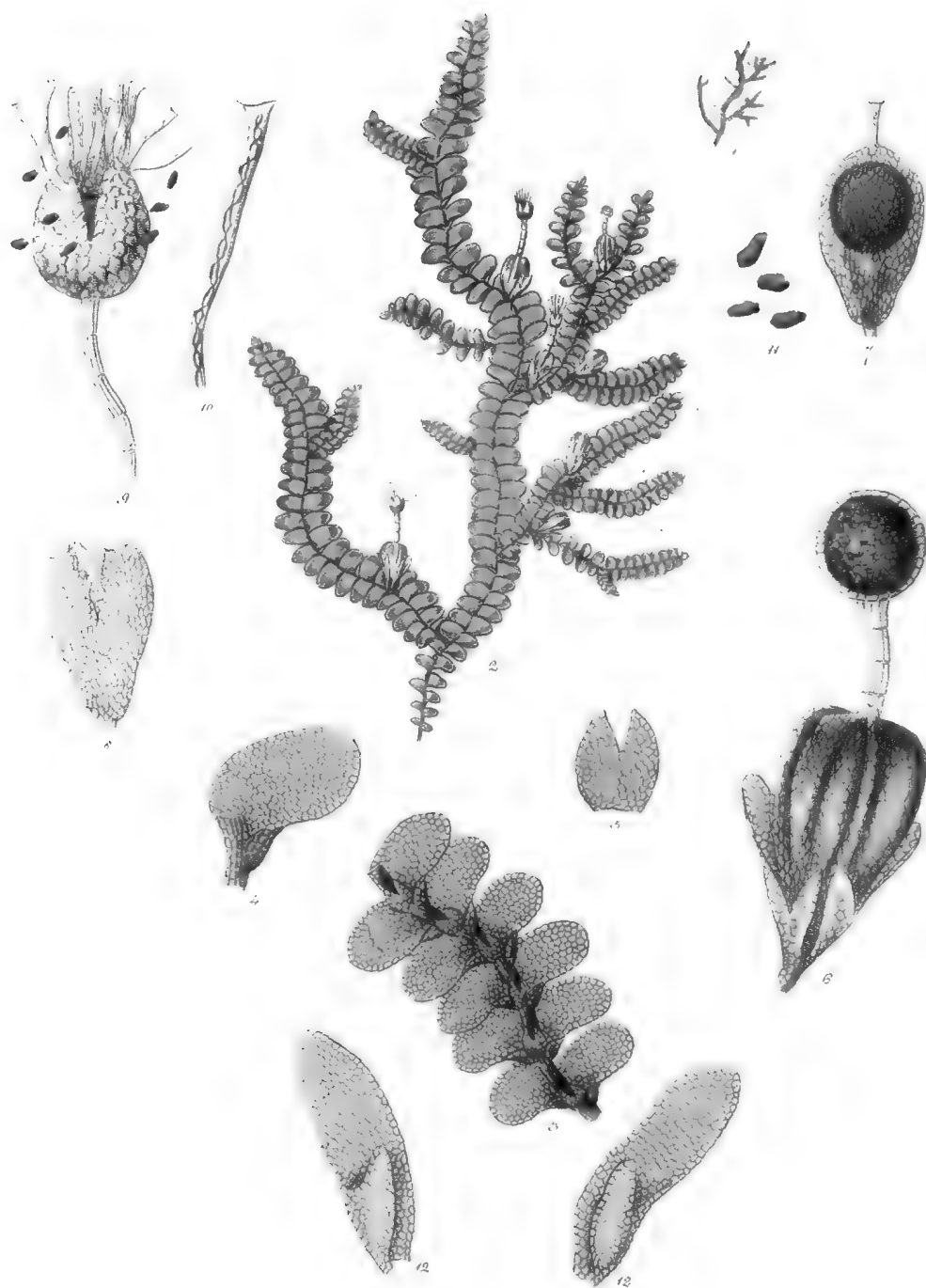
(*J. stipulacea*.)

REFERENCES TO THE PLATE.

FIG.

1. <i>J. stipulacea</i> , natural size.	
2. 3. Lateral views of the same, magnified.....	6
4. Under side of ditto	6
5. Fructified plant of ditto	6
6. Portion of the stem with its leaves and stipules	4
7. Perichæatial leaf	4
8. Stipules	2
9. Calyx	4
10. Calyx longitudinally opened to shew the Calyptra	4
11. Seeds and spiral filaments	1





Jungermannia serpyllifolia.
Lejeunea serpyllifolia

JUNGERMANNIA SERPYLLIFOLIA.

(TAB. XLII.)

JUNGERMANNIA surculo repente, filiformi, flexuoso, vagè pinnatim ramoso: foliis distichis, auricularibus*, (seu sub-bilobis; lobis inæqualibus, superioribus majoribus, rotundatis, basi subtus ventricosus; inferioribus minutis, involutis:) stipulis rotundatis, acutè profundèque bifidis: fructu laterali axillarique; calycibus latè obovatis, pentagonis; ore contracto, elevato, subdentato.

Jungermannia serpyllifolia. DICKS. *Crypt. Plant. Fasc. 4. p. 19.*

Jungermannia minima, foliis auritis, ex rotunditate acuminatis, punctatis ac veluti perforatis, floribus virescentibus, vaginâ cordiformi. MICHELI, *Nov. Gen. p. 9. t. 6. f. 19.*

Lichenastrum, quod Jungermannia minima, foliis auritis, ex rotunditate acuminatis, punctatis ac veluti perforatis, floribus virescentibus, vaginâ cordiformi. DILL. *Musc. t. 72. f. 30.*

β. OVATA; foliis minoribus, ovatis, sub-acuminatis.

HAB. "In sylvis inter muscos." D. Dickson.—Upon the trunks of trees, very abundant, near Copgrove, Yorkshire.—About Bantry. Miss Hutchins.—Not uncommon in mountain glens, near Belfast. Mr. Templeton.—North Brook, Furzy Lane, New Forest; and upon rocks at Lowdore and Keswick, and on Castle-hill, Kinnordy, Scotland. Mr. Lyell.—Powerscourt waterfall, with Calyces, May 23rd. Dr. Taylor.—Mam Turk, Cunnamara, and mountains near Killarney, Mr. Mackay; found about the latter place, also, by Sir Thomas Gage, Bart.—Rocks by the waterfall on the Dee, near Mar Lodge. Mr. George Donn.—(The male fructification is produced in June; the female, during the spring months.)—β. is found upon rocks near Bantry, by Miss Hutchins.

PLANT growing in rather large and dense patches; the different individuals, of which the patches are composed, imbricating each other in a very compact manner.

Surculi from half to three-quarters of an inch in length, filiform, flexuose, extremely slender, branched irregularly in a pinnated manner, the various shoots, which are

* I have called the leaf of this species a "*folium auriculare*," from the close resemblance it bears to the shell, *Helix auricularis*.

(*J. serpyllifolia*.)

BRITISH JUNGERMANNIÆ.

as uncertain as possible in number, length, and situation, being all on the same plane; these are mostly simple, but sometimes again beset with a few short, simple ramuli.

Leaves (f. f. 3. 4) rather closely imbricated (at least in α) over the whole upper side of the stem, bifarious, somewhat two-lobed, having the upper lobe by far the largest, and the sixth, or sometimes even the fourth of a line long, horizontal, ovate, very slightly convex above, the base beneath ventricose, where the lesser lobe arises, which, perhaps, might with more propriety, be called a dilated and remarkably involuted portion of the margin: taken altogether, the leaf very correctly resembles a specimen of the *Helix auricularis*, by which comparison its figure will be better understood, than could be the case by means of words. The *texture* is delicate; the *cellules* large, roundish. The *color* a pale yellow-green.

Perigonal leaves (which I had not seen till it was too late for them to be represented on the plate) closely imbricated upon short ramuli, forming ovate compact masses, like those of *J. platyphylla*. They are ventricose at the base, but the lobule is less involute than that of the cauline leaves.

Perichæatial leaves (f. f. 6. 12. 13) of quite a different figure from any of the rest, being much larger, and divided deeply into two oblongo-ovate obtuse and slightly convex lobes, which closely embrace the calyx: the upper one is about thrice the size of the lower.

Stipules (f. 5) roundish, plane, cleft above a third of their length into two sharp and equal segments, whose sinus is rather acute, extending about one-third of the length of the stipule.

MALE FRUCTIFICATION: a single *Anther* is situated in the axilla of each perigonal leaf. It is reticulated, spherical, and terminates a short, white, transversely striated footstalk.

FEMALE FRUCTIFICATION lateral and axillary.

Calyx (f. 6) about twice the length of the leaves, widely obovate, at the base cylindrical, thence gradually becoming of a larger diameter towards the extremity, furnished throughout its whole length with five longitudinal sharp angles. The *mouth* small and protruding into a short tube.

Calyptra (f. f. 7. 8) extremely thin and delicate, so that the young capsule may be seen within it. The reticulation is large, and the areolæ oblong; the *style*, with which it is terminated, is long, tubular, and slightly expanded at the mouth.

Peduncle about twice the length of the calyx, wholly composed of a number of parallel tubes, all of equal length, which are placed in distinct bundles, so that by the termination of the several parcels, are formed distinct transverse lines, dividing the footstalk into several joints. In a dry state, these joints are bent with much regularity to the right and left alternately, and give the peduncle a zigzag appearance.

Capsule (f. 9) perfectly spherical, white, beautifully marked with large and roundish reticulations; so transparent, that the green *seeds* may be seen through it, and the extreme edge forms round these a white ring or limbus. It opens into four equal valves, which, extend only half its length (f. 9), and always preserve their vertical direction, never becoming reflexed, or even patent.

The *spiral filaments* (f. f. 9. 10) are composed of a double *helix*, slightly twisted, enclosed within a large semipellucid tube, much expanded at the mouth. The *seeds* (f. 11) are few in number, large, oblong, somewhat angular, of a dark green color.

BRITISH JUNGERMANNIÆ.

(*J. serpyllifolia*.)

The var. β . *ovata* differs from α in its smaller size, and in having the leaves more convex on the upper surface, and of an ovate figure, acuminate at the point: which appears, indeed, at first sight, more striking than is really the case, from the circumstance of the margins of the leaves being incurved.

It is not a little remarkable that a species, which does not seem to be confined to a few parts of the kingdom, should, among British Botanists, have found only one author who has given a description of it; and, even among foreigners, Micheli alone seems to have been acquainted with it. This excellent observer has displayed singular acuteness in the figure and description he has given us of this plant, and its diminutive associate *J. minutissima*. Dillenius, however, professedly ignorant of the plants themselves, has copied both the representation and words of Micheli, not without expressing his doubts as to their accuracy, which he certainly would not have done, had the specimens fallen under his own notice. "Sed vereor," is his remark, "ut valdè accuratæ sint, ob parvitatem suam: capitulæ videntur Anthæræ nondum explicatæ, in quibus non capio, quid sint pili in summitate. Quæ puncta vocat, pinnulæ procul dubio sunt secundariæ." These "capitulæ," or "Anthæræ," as Dillenius considered them, and the "pili in summitate," are very striking characters in the species, though they are not confined to it, since we are now acquainted with four species being thus distinguished; *J. hamatifolia*, *J. calyptrifolia*, *J. minutissima*, and the subject of the present description. To the former of these it is that *J. serpyllifolia* comes the nearest in its foliage, but the calyces will be found to differ materially, as will the leaves, though there is certainly a considerable resemblance between those of the variety described above, and of *J. hamatifolia*: the latter are, however, much smaller, still more acuminate and incurved, and have the lobule or expanded and involuted margin occupying a much greater portion of the lobe. A difference will likewise be seen in the stipules. Both Miss Hutchins and Mr. Lyell have often found the two species growing together; but they have never experienced any difficulty in distinguishing them.

Mr. Dickson has quoted, as a synonym to *J. serpyllifolia*, DILL. *Musc. t. 72. f. 28.* instead of f. 30., which appears to have been done through mistake, the former figure being also referred to as his *J. cinerea*; a species which I am disposed to consider only an injured state of *J. dilatata*.

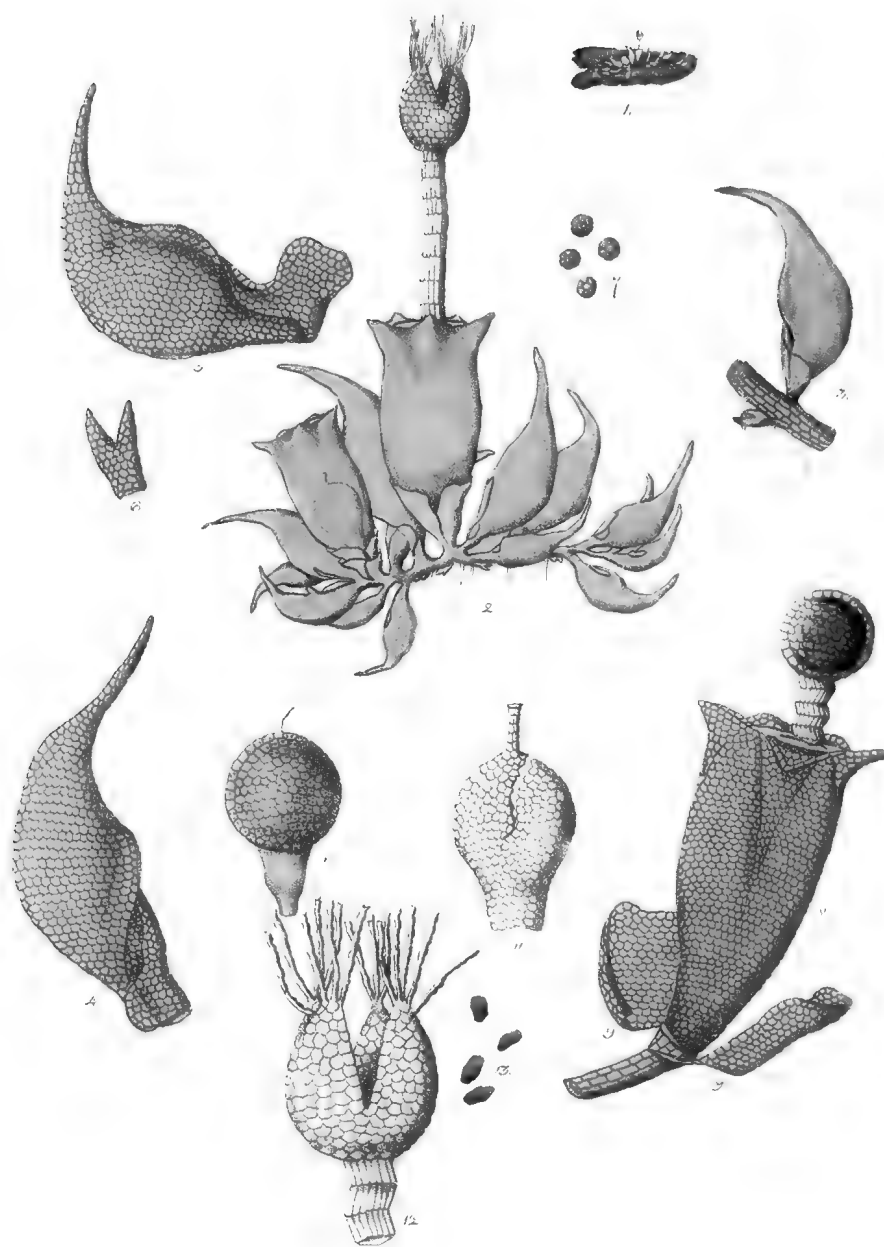
Various degrees of temperature seem adapted to the present Jungermannia, which is not only found in Italy, and in the North and South of Great Britain, but also in the still colder climate of Sweden, as I learn by the kind communications of Dr. Swartz.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. serpyllifolia</i> , natural size.	
2. The same magnified	6
3. Portion of the stem, its leaves, and stipules.....	4
4. Simple leaf	3
5. Stipule	3
6. Calyx, perichæatial leaves, and capsule	3
7. Calyptra, with the young capsule within	2
8. Calyptra burst	2
9. Capsule, seeds, and spiral filaments.....	2
10. Spiral filament enclosed within its tube	1
11. Seeds.....	1
12. Perichæatial leaves	2





Jungermannia calyptriifolia.
Colore calyptriifoliae nobilissimae

JUNGERMANNIA CALYPTRIFOLIA.

(TAB. XLIII.)

JUNGERMANNIA, surculo repente, ramoso: foliis bilobis; lobis inæqualibus; superioribus majoribus, calyptriformibus; inferioribus obtusè quadratis, circumvolutis: stipulis oblongis semibifidis: fructu laterali; calycibus oblongis, sursùm quinquedentato; apice depresso, plano; ore contracto.

HAB. On the stems of the *Ulex nana*, near the ground, in heathy mountainous places in the neighborhood of Bantry, intermixed with *J. hamatifolia*. *Miss Hutchins.*—*Mr. Lyell* finds it growing intermixed with the same plant upon rocks at Lowdore.

This singular PLANT grows in little pale green tufts, scarcely half an inch in diameter.

The *roots* are distantly scattered about the under side of the stems, and are composed of extremely minute, whitish, pellucid, simple fibres.

Surculi from one to one and a half, rarely two lines in length, creeping, filiform, flexuose, once or twice divided with short, procumbent, patent branches: they are of a pale green color, and have the cellules very visible under a magnifying power.

The *leaves* (f. f. 3. 4. 5) are rather closely placed, bifarious, horizontal, patent, or erect, even on the same individual; at the base of the plant the largest, thence gradually lessening towards the apex of the branches, unequally two-lobed, having the superior one the largest (although, from the crowded mode of growth of the plant, the leaf is not unfrequently forced into such a position, that it may appear to be the inferior one, as may be seen in f. 2), four-tenths of a line in length, so precisely the shape of that sort of *calyptra* in mosses, which Mohr has called "*mitriformis*," that I cannot do better, in the specific character, than designate it by the term "*calyptriformis*." In other words, it may be described as oviform*, its base narrowed, furnished with a narrow opening, which is about one-half the length of the leaf, its apex lengthened out, incurved and acute; the lesser lobe (f. 5) is subquadrate, having the angles obtuse; it is appressed to the larger one, half embracing it and concealing the opening (f. f. 3. 4). The color, throughout, is a pale yellow-green; the texture delicate; the cellules rather large, roundish.

* The word *ovate* having been applied to *flattened* leaves, I trust I shall be excused for adopting a term, by which I mean to express that a transverse section would represent a round figure, as is seen by a similar section of an egg.

(*J. calyptrifolia*.)

BRITISH JUNGERMANNIÆ.

Perichætical leaves (f. 9) varying in number from two to four; erect, closely appressed to the sides of the calyx, of which they are about one-fourth of the length, nearly quadrate, their sides incurved, their apex obtusely and widely emarginate.

Stipules (f. 6) small, oblong, plane, appressed to the stem, or a little patent, divided for about one-third of their length from the extremity, by an acute sinus, into two equal, strait, and acute segments.

MALE FRUCTIFICATION unknown.

FEMALE FRUCTIFICATION lateral.

Calyx (f. 8) large in proportion to the size of the plant, oblong, attenuated at the base, widening towards the extremity, where there are five projecting patent angles or teeth, which are very decurrent, extending sometimes one-third, and sometimes even more, of the length of the calyx: its extremity is depressed, and even flattened; the *mouth* much contracted, and a little jagged. In *color* and *texture* the calyx exactly resembles the leaves.

Calyptra (f. f. 10. 11) spherical, narrowed and attenuated at the base, strongly reticulated, tipped with a tubular *style*.

Peduncle about twice the length of the capsule, divided by transverse septa into a number of joints, each of which is composed of many minute capillary tubes; thus giving the peduncle an appearance which is observable in those marine *Confervæ* which Mr. Dillwyn has called "*longitudinalitèr venosæ*," and, in which, he says, "the filament is an aggregation of several smaller tubes*".

Capsule exactly spherical, white, membranous, pellucid, reticulated, dividing, for half its length only, into four equal, erect, conical segments, which support at their extremities the

Spiral filaments, in the form of a small tuft or pencil; they are few in number, each appears (for I have not been able in the dry specimens to satisfy myself on this point so well as I could wish) to be formed of a double *helix*, and is enveloped in a thin, pellucid, membranous tube, open and a little expanded at the mouth. The *seeds* are large, of an oblong figure, here and there obtusely angular, of a dark green *color*.

Gemmæ (f. 7) appear to be not uncommon, and are produced upon various parts of the stem, whence they readily separate, and upon the table of the microscope are seen floating about in the water, almost the instant the plant is immersed: they are larger than the seeds above described, nearly orbicular, depressed, composed of a few large cellules: the *color* is pale green.

J. calyptrifolia is one of the most curious species, and the most unlike every other in the Genus, that have been discovered by the two often-mentioned botanists, Miss Hutchins and Mr. Lyell. Hitherto it has always been found growing along with *J. hamatifolia*; but though so evidently

* Dillw. *British Confervæ*, p. 8. and 80.

BRITISH JUNGERMANNIÆ.

(*J. calyptrifolia*.)

of the same natural family, agreeing with it in the singular structure of the capsule, seeds, and filaments, still, the form of the leaves is so different, that no difficulty will be found in distinguishing the two plants.

Although I have called the little spherical bodies, observable upon the stems, *Gemmæ*, I ought to remark, that they are quite of a different nature from those minute particles, (to which I have given the same name) that are produced upon the extremities of the stems or leaves of *J. bicuspidata*, *J. exsecta*, *J. ventricosa*, &c.; these having no apparent internal organization, while the former are composed of cellules as large as those of the leaf. Similar *Gemmæ* (if such they may be called) are found on *J. minutissima* and *J. hamatifolia*, and, probably, also (though I have not yet been so fortunate as to meet with them) upon *J. serpyllifolia*.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. calyptrifolia</i> , about twice* the natural size.	
2. A single plant, magnified	6
3. Portion of a stem, and a leaf.....	5
4. A leaf, with the lobule in its natural position	3
5. The same, with the lobule expanded	3
6. Stipule	3
7. <i>Gemmæ</i>	2
8. Calyx	3
9. Perichæatial leaves	3
10. Calyptra, inclosing its capsule	2
11. An old Calyptra	2
12. Capsule with its tubes, which contain the spiral filaments	1
13. Seeds.....	1

* The figure here referred to, is represented larger than nature; because, to have done otherwise, the minuteness of the plant would have prevented its appearing otherwise than as a small, green, shapeless mass.

1. 10/1/1912

2. 10/1/1912

3. 10/1/1912

4. 10/1/1912

5. 10/1/1912

6. 10/1/1912

7. 10/1/1912

8. 10/1/1912

9. 10/1/1912

10. 10/1/1912

11. 10/1/1912

12. 10/1/1912

13. 10/1/1912

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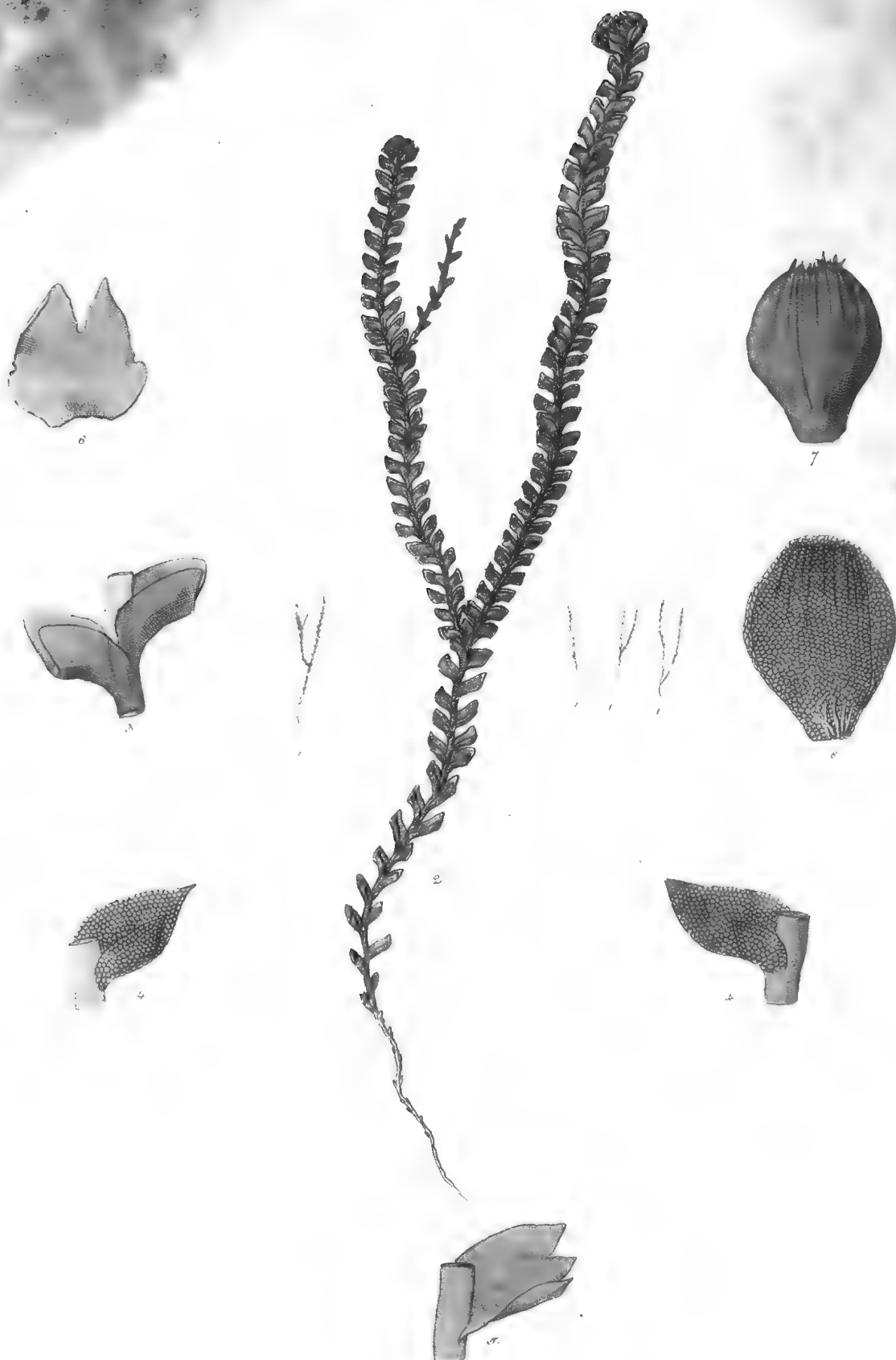
36. 10/1/1912

37. 10/1/1912

38. 10/1/1912

39. 10/1/1912

40. 10/1/1912



Jungermannia minuta.
phenolobus minutus (Lantz) Steph

BRITISH JUNGERMANNIÆ.

(*J. minuta.*)

JUNGERMANNIA MINUTA.

(TAB. XLIV.)

JUNGERMANNIA, caule erecto, subdichotomo: foliis bifariis, horizontalitèr patentibus, subconduplicatis; superioribus æqualitèr, inferioribus inæqualitèr, bilobis, omnibus acutiusculis: fructu terminali; calycibus obvatis, apice parùm plicatis; ore contracto, denticulato.

Jungermannia minuta. CRANTZ, *Hist. Groen. cont.* p. 285. (*fide Dicksoni*). DICKS. *Plant.*

Crypt. Fasc. II. p. 13. WITH. p. 855. LINN. *Syst. Nat. ed. Gmel.* II. p. 1349.

Jungermannia rupicola. SCHLEICHER, *Plant. Crypt. exsicc.*

Lichenastrum, pinnulis minutissimis rotundis. DILL. *Musc. t.* 69. f. 2.

HAB. "Inter muscos in alpebus scoticis." DICKS. *l. c.*—Upon Cairn-gorum and Ben Nevis.

—About Bantry. *Miss Hutchins.*—At Catlaw, Isla and the Castle Hill, Kimordy, Angus-shire. *Mr. Lyell.*—(The Capsules are formed during the spring and summer months.—Male fructification has been found by *Mr. Lyell* in August).

PLANT growing in rather small, loosely entangled patches of small extent, and of a brownish-green color.

Stems nearly erect, filiform, flexuose, from half an inch to an inch and a half in length, simple, or only once or twice dichotomous, with long undivided branches, upon which a short lateral innovation is occasionally here and there produced: they are of a close texture, of a brownish color, rigid and brittle when dry.

Leaves (f. f. 3. 4) about one-fourth of a line long, rather distantly placed, more apart at the base of the plant, at the extremity collected into a little cluster, bifarious, horizontal, subquadrate, having the sides inclining to conduplicate, but not strictly so, and so appressed in their lower part to the stem, that it is almost entirely concealed; the upper ones are divided into two equal, rather acute lobes; but, in proportion as they recede from the apex, they become more unequal and acute, and the lower ones of all (f. 4), bear no small resemblance to the leaves of that family to which *J. nemorosa* and its congeners belong: here and there a leaf may be found having three lobes or segments (f. 5), but such is probably the effect of accident. Upon the innovations,

(*J. minuta*.)

BRITISH JUNGERMANNIÆ.

the leaves are more distantly placed, very small, and very unequally lobed. The *texture* is rigid, especially in a dry state; the *cellules* small, roundish. The *color* a yellow-green, much inclining to olive or brown.

Perigonial leaves, more concave than the rest, and even ventricose at the base; but in other respects like them: in general, they are only seen near the extremity of the stem.

Perichæatial leaves (f. 6) large, roundish, divided into two, or, not unfrequently, three, acute lobes or segments. When only two segments, I have observed a small lobe towards the base; probably the rudiment of a larger one. Their *color* is paler than that of the cauline leaves, and they are of a more delicate *texture*.

MALE FRUCTIFICATION. *Anthers*, situated in the axillæ of the perigonial leaves, two or three in each, spherical, reticulated: the footstalks short, white, transversely striated.

FEMALE FRUCTIFICATION terminal.

Calyx, at first globose (f. 7), and wholly concealed by the perichæatial leaves; at length becoming obovate, or even obovato-oblong, three-fourths of a line long, a little plicate above; the mouth contracted, and fringed with very minute teeth.

Peduncle half an inch long, white, cellulose.

Capsule oblongo-ovate, of a reddish brown *color*, striated longitudinally and transversely, and opening into four, equal, lineari-lanceolate valves.

Seeds and *spiral filaments* fulvous brown, the former of a spherical form, smooth; the latter composed of two short and closely twisted *helices*.

Obs. At Isla, on the 21st of July, Mr. Lyell discovered *Gemmæ* upon this species, bearing a considerable similarity to those of *J. inflata*, (as represented by Schmidel) and those of *J. excisa*; but far less compact than the latter, and more confined to the terminal leaves than appears to be the case with the former. They are of a red *color*, minute, angular, pellucid, presenting no internal organization, collected into small, though by no means compact balls, at the apex of each lobe of the leaf.

The Dillenian plants which came from Greenland, and are preserved in the Herbarium at Oxford, though exactly agreeing with the specimens here figured, as well as with others which have been given me by Mr. Dickson, are, nevertheless, very unlike the figure and description in the *Historia Muscorum*, and, indeed, so much so, that it seems scarcely possible that these latter could have been made from those individuals. The fructification of *J. minuta* was entirely unknown, till detected by Miss Hutchins and Dr. Taylor, in Ireland, and, subsequently, in Scotland, by Mr. Lyell, who, alone, has found both anthers and capsules.

This is an elegant and extremely well defined species, and has a peculiarly neat appearance, from the circumstance of the leaves being most regularly disposed, all placed in a nearly horizontal direction, and, as it were, in a pinnated manner. In *color*, it nearly approaches some of the states of *J. inflata*; and some of the leaves bear a considerable affinity with that species, but they have the sides always conduplicate, and the points more acute. The lower leaves, being

BRITISH JUNGERMANNIÆ.

(*J. minuta*.)

unequally two-lobed, indicate an affinity with the family, "*foliis inæqualitèr bilobis*," whilst the upper ones resemble those in the division, "*foliis æqualitèr bilobis*." So that, in fact, it holds an intermediate rank: though, perhaps, most nearly allied to the former, by the perichæatial leaves having a greater number of lobes than the rest, which is never the case with the latter. By means of an authentic specimen, communicated by Dr. Swartz, I am able to add the synonym of Schleicher. The same friend has also sent me specimens which he gathered in Sweden.



REFERENCES TO THE PLATE.

FIG.

1. <i>J. minuta</i> , natural size.	
2. An individual, magnified	6
3. Upper part of the stem and leaves	4
4. Lower leaves	4
5. A trifid leaf	4
6. Perichæatial leaf	4
7. A young* calyx	3
8. The same, dissected longitudinally	3

* I was not acquainted with the full-grown calyx, till it was too late to have it inserted in the plate.

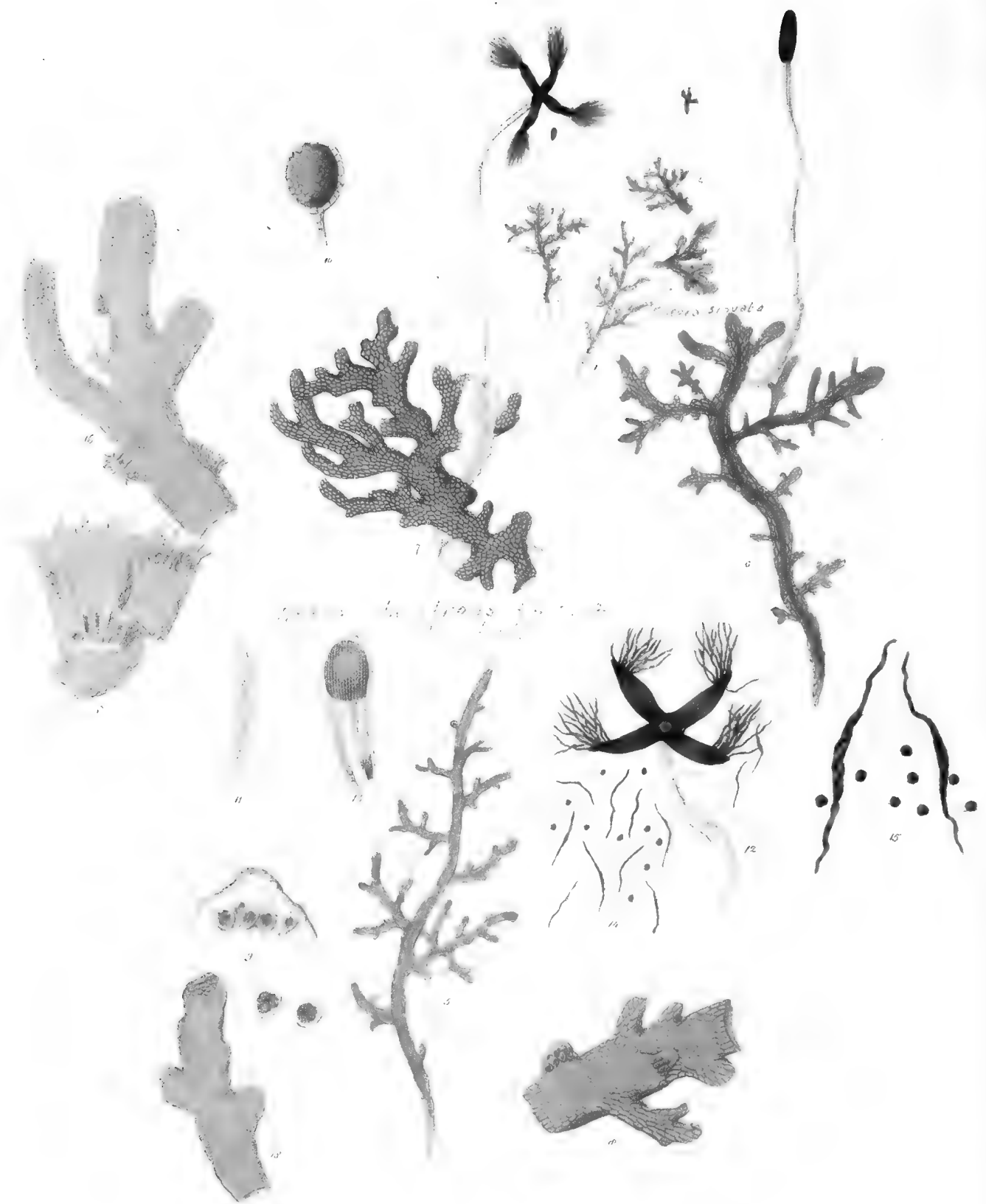


ERRATUM.—In the description of *J. cordifolia*, second page, l. 20, for *J. minuta*, read *J. pumila*.

1. The first of the two main parts of the book is devoted to a general survey of the history of the theory of the origin of life. It begins with a brief review of the views of the ancient philosophers on the origin of life, and then proceeds to a more detailed examination of the theories of the modern scientists. The second part of the book is devoted to a detailed examination of the theories of the origin of life, and is divided into two main sections: the first section is devoted to the theories of the origin of life, and the second section is devoted to the theories of the origin of the organic molecules.

2. The second part of the book is devoted to a detailed examination of the theories of the origin of life, and is divided into two main sections: the first section is devoted to the theories of the origin of life, and the second section is devoted to the theories of the origin of the organic molecules.

3. The third part of the book is devoted to a detailed examination of the theories of the origin of life, and is divided into two main sections: the first section is devoted to the theories of the origin of life, and the second section is devoted to the theories of the origin of the organic molecules.



Sargassum multifidum
Sargassum multifidum Lamour.

JUNGERMANNIA MULTIFIDA.

(TAB. XLV.)

JUNGERMANNIA, fronde lineari, enervi, carnosâ, compressâ, pinnatim ramosâ: fructu marginali: calycibus brevissimis; ore dilatato, fimbriato: calyptrâ exsertâ, oblongo-cylindraceâ, tuberculatâ.

Jungermannia multifida. LINN. *Sp. Pl.* II. p. 1602. *Syst. Nat.* II. p. 707. *Fl. Suec.* p. 404. LEERS, *Herb.* p. 253. WEIS, *Plant. Crypt.* p. 109. WEBER, *Spic. Fl. Goet.* p. 159. OEDER, *Enum. Pl. Fl. Dan.* p. 43. SCHREBER, *Spic. Fl. Lips.* p. 109. SCHMIDEL, *Icones.* p. 213. t. 55. ROTH, *Germ.* III. p. 412. HOFFMANN, *Germ.* II. p. 91. HUDS. *Angl.* p. 517. LAMARCK, *Encycl. Bot.* III. p. 287. LINN. *Syst. Nat. ed. Gmel.* II. p. 1353. LAMARCK, *Fl. Fr. ed. 2.* v. II. p. 426. WITH. p. 851. *Engl. Bot.* t. 186. *Lichenastrum Ambrosiæ Divisurâ*. DILL. *Musc.* t. 74. f. 43.

β. SINUATA; frondibus latioribus, ramosis, margine sinuatis.

Jungermannia sinuata. DICKS. *Pl. Crypt. Fasc.* II. p. 16. WITH. p. 851. *Engl. Bot.* t. 1476. *Ulva palustris foliis Ivæ moschatae instar divis.* RAII *Syn.* p. 64. n. 10. *Marsilea terrestris minima, foliis sinuatis, floribus nigricantibus.* MICHELI, *Nov. Gen.* p. 5. t. 4. f. 3. *Lichenastrum Chamædryos multifidæ divisurâ*. DILL. *Musc.* t. 74. f. 44.

HAB. Moist places upon heaths; also in marshes, and on the sides of ditches; abundant in various parts of Great Britain.—(The fructification is produced in the spring months, sometimes under water.—Gemmæ are found by Mr. Lyell, in November.)

PLANT generally growing in thickly-crowded tufts of considerable extent.

Roots, a few small, whitish, simple fibres, descending principally from the lower parts of the plant.

Fronds from half an inch to an inch and half in length, and half or three-fourths of a line, or more, in diameter, compressed, erect in general, but sometimes, especially in the broader varieties, decumbent and imbricating each other, always branched, but extremely various in their ramification, often being twice or thrice divided in a most irregular manner, with narrow laciniae in every respect resembling the main part of the frond, (f. 7) while, at other times, which is indeed most common, they are seen to be pinnate

(*J. multifida*.)

BRITISH JUNGERMANNIÆ.

or bipinnate (f. f. 1. 3. 5. 6), in which case, the pinnæ are distantly placed, alternate, patent or horizontal, beset with less remote pinnulæ, which are again not unfrequently furnished with other still smaller ones: all these at the apex are obtuse, and somewhat dilated, rarely emarginate. The *substance* of the plant is carnose, succulent, externally appearing reticulated, but within evidently composed of many cellules, which, in the thicker individuals, cause it to appear opaque when held against the light; the thinner ones are more pellucid. The *color* is a pale green, more or less inclining to yellow, and even brown, after having been long dried.

MALE FRUCTIFICATION (f. 8) situated in prominent tubercles, arising from various parts of the frond. In each of these, there are four or five *Anthers* (f. 9) imbedded within the cellular substance, of a nearly spherical figure, sometimes inclining to ovate, reticulated externally; within having a greyish granulated pollen, around which a pellucid border or limbus is often visible (f. 10). The *footstalks* are white, and transversely striated.

FEMALE FRUCTIFICATION (f. f. 6. 7. 16. 17) always arising from immediately beneath the margin, never terminal, nor by any means confined to the base of the plant, as some authors have considered it to be.

Calyx (f. 17) very short, somewhat hemispherical, having, however, its base slightly attenuated, its mouth expanded, and cut into numerous short, but unequal, sharp laciniaë, which give it a beautifully fimbriated appearance. In *color* it resembles the frond, and in *texture* likewise, except that it is thinner, and the cellules, at the extremity of the laciniaë, form a simple series, like the joints of a *Conferva*.

Pistilla (f. 17) five or six in each calyx, of a pale, greyish color, striated longitudinally and transversely, their figure ovato-oblong, with the *mouth* slightly expanded. After impregnation, one of them rises erect, or at most with a little curve at its base, to the height of a line, or even more: then becoming the

Calyptra, oblong, of a nearly cylindrical figure, widening, however, a little, but gradually, towards the extremity; its base filling the whole calyx, which is closely appressed to it: its apex is often terminated by a very short and tubular style, but more frequently nothing is there observable but the minute tubercles which cover every other part of the calyptra, and form one of the most striking characters of the species. The whole is of a yellowish white *color*, the *texture* thick, fleshy, cellulose. At the apex, it bursts with a small and jagged opening, for the emission of the capsule.

Peduncle nearly an inch in length, white, cellulose, not unfrequently twisted.

Capsule large, oblong, brown, striated longitudinally and transversely, dividing, at length, into four equal lineari-lanceolate segments or valves, and discharging the

Seeds, which are spherical, and fulvous. The *spiral filaments* are of the same color, composed of a single *helix* (f. 15) tapering at each extremity: these are affixed to the apices of the valves, and there the greater number of them continue to adhere in the form of tufts or pencils after the dispersion of the seeds, and till the capsule itself is in a state of decay.

Gemmæ (f. f. 18. 19) produced in small loose clusters, beneath an incurved extremity of the stem, whence they are easily detached, and, under a microscope, appear to be composed of a nearly spherical, pellucid, white, and extremely thin cuticle, within containing a mass of a green, minutely granulated substance, which is often collected into three distinct balls. The individuals, which I have hitherto observed to produce these *Gemmæ*, are such as have neither male nor female fructification.

In the var. β . the *J. sinuata* of *Engl. Botany*, I can perceive no difference, except that the frond is somewhat wider, and the divisions or lateral segments are frequently, but by no means constantly, so short that the margins appear to be here and there sinuate, rather than cut into segments.

For want of fructified specimens of the *J. palmata* of Hoffmann, a plant evidently most nearly allied to *J. multifida*, I am unable to point out from my own observation any other marks of distinction by which it may be known from the species here described, than its smaller size, its more cylindrical shoots, and its disposition to be branched principally at the base of the frond. Other characters, however, will be found in the fructification, as detailed by Hedwig, whose remarks on the Anthers shall be here transcribed. "Masculus e contrâ in distinctâ plantulâ apices processuum occupat, plerumque tunc tumidiores spongiosos, vesiculari ad ambitum habitu. Hujus de medio transparent circelli lucidi, in quibus continentur folliculi masculi pedicellati. Absoluto flore, dehiscit intumescencia, deinde planè cadit, truncatos relinquens processus*." And, besides the difference in the male fructification, in the female the same author represents the calyptra as having a small brown covering like the calyptra of a moss, which does not exist in our plant. (see *Theoria*, tab. 19. f. 96.) *J. pinguis* is the only other species with which *J. multifida* is likely to be confounded; and here it must be observed, that it is only allied to some of the narrowest and most branched varieties. The former, however, is always more thick and succulent, is plane on its upper surface, and never presents a reticulated appearance; its size too is much larger, and its calyptra, in every instance, free from tubercles.

The three Jungermanniæ just enumerated, belong to that division of the genus, the individuals composing which have been called "*Acaules*," and differ from all the rest of that family, in having no traces of a nerve, or perhaps, more correctly speaking, in being, altogether, composed of nerve or stem, and destitute of those lateral and more membranous expansions, which have caused all the rest of the genus to be called, in contradistinction to these, *foliosæ*; and which, even in one species of this very section, have a considerable approach to the appearance of the leaves in other plants. In *J. furcata* the frond has this membranous expansion continued uninterruptedly from the base to the extremity; in *J. epiphylla* the margin is here and there slightly lobed, whilst, in *J. Blasia* (*Blasia pusilla* of Authors) the lobes are so deep, and so regular, that this species seems to hold an intermediate place between the "*Jungermanniæ Foliôsæ* and the *Frondosæ*." That the more membranous part of these species is analogous to the leaves in the others, will be still more apparent, when it is observed, that neither roots nor male nor female fructification are produced (as far, at least, as my experience will enable me to speak) upon it. *J. epiphylla*, in some of its states, may appear an exception to this remark; but even the older specimens, when held up to the light, will be seen to have an obscure, though wide, nerve, whence originate, on the upper surface, both the male and female fructification, and, on the lower surface, the roots. In younger plants the nerve is very conspicuous, as it is in the innovations. The situation of the *spiral filaments*, attached to the ends of the valves of the capsule, is, unfortunately, not confined to *J. multifida*, *J. palmata*, and *J. pinguis*; for they are so fixed in *J. furcata*, which, in other parts of its fructification, differs materially from those species.

* *Theoria*, p. 87. t. 18. f. 94.

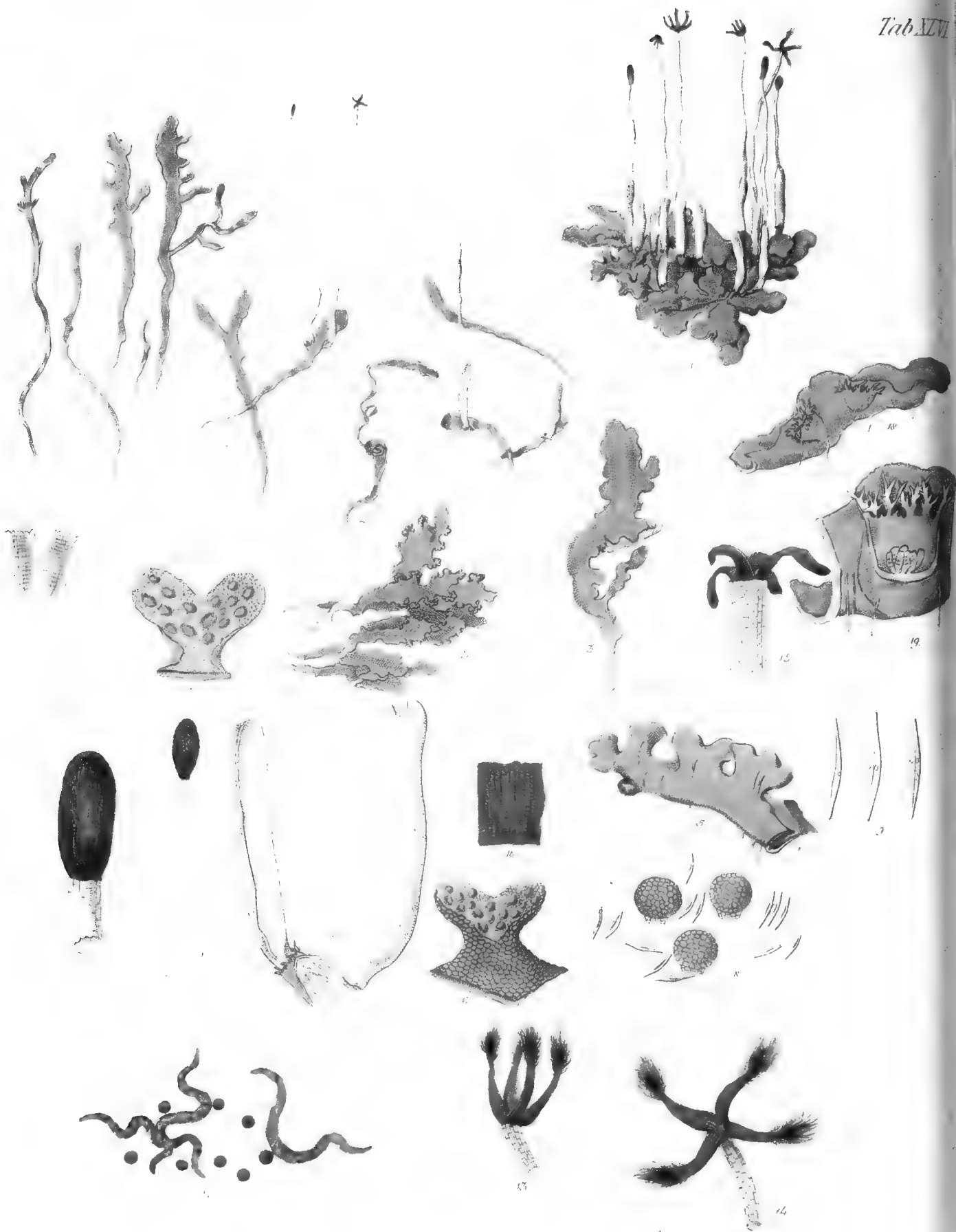
The true calyx does not appear to have been noticed by any author, and, indeed, is not readily observable, except before the exsertion of the calyptra, which Schmidel has mistaken for it. Neither do the Gemmæ*, figured by this author, (his Anthers, see his *Icones*, t. 55. f. 6) accord in situation with those which have been communicated to me by Mr. Lyell, and which, in all the specimens, were collected together beneath an incurved extremity of the frond; whilst those of Schmidel are collected in a mass at the very apex. "Verno tempore," he says, "Martio aut Aprili, interdum jam autumnopragresso, antequam ullus calix notabiliter excrevit, certè antequam ullus aperitur, in ramulorum extremorum corniculorum apicibus plurimis adparere solent vesiculæ minutissimæ, totâ reliquâ substantiâ pellucidiores et in flavum colorem vergentes. Hæ vesiculæ post aliquam moram fatisce, et membranulas exsuccas relinquere videntur, quæ pellicularum albarum formâ apicibus ramorum passim inhærere solent. Vero quidem non absimile videtur, in his vesiculis succum fœcundantem elaborari et contineri, cujus receptacula absolutâ functione flaccescunt." *Icones*. p. 215.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. multifida</i> , natural size.	
2. var. β . <i>sinuata</i> , natural size.	
3. 4. <i>J. multifida</i> , with female fructification, natural size.	
5. Sterile plant, magnified	6
6. Female plant.....	5
7. Female plant.....	5
8. Portion of a male frond	4
9. Antheriferous tubercle, dissected.....	2
10. Anther	1
11. Calyptra	4
12. Capsule, with its valves expanded	4
13. Calyptra, longitudinally dissected, to shew the young capsule.....	4
14. Seeds and spiral filaments	4
15. The same	1
16. Calyx and young calyptra	4
17. Calyx torn open to exhibit the pistilla	2
18. Extremity of a gemmiferous frond.....	4
19. Gemmæ.....	1

* It is possible that these are intended for the Anthers of *J. palmata*, which Schmidel does not appear to have been acquainted with as a distinct species; yet, so acute an observer would hardly have permitted the footstalks to have escaped his notice.—Hoffmann, in his *Flora Germanica*, indeed, under *J. palmata*, says, "Hujus loci vel peculiaris species videtur *Jung. multifida*, Schmidel, *Icones*, t. 55."



Jungmannia pinguis.

JUNGERMANNIA PINGUIS.

(TAB. XLVI.)

JUNGERMANNIA, fronde oblongâ, decumbente, enervi, carnosâ, suprâ planiusculâ, subtus tumidâ, hîc illic divisâ, margine sinuatâ: fructu ex inferiore parte prope marginem egrediente; calycibus brevissimis; ore dilatato, fimbriato; calyptrâ exsertâ, oblongo-cylindraceâ, lævi.

Jungermannia pinguis. LINN. *Sp. Pl.* II. p. 1602. *Syst. Nat.* II. p. 706. *Fl. Suec.* p. 403. SCOP. *Carn.* II. p. 351. LEERS, *Herb.* p. 252. SCHRANK, *Bavar.* II. p. 501. WEIS, *Plant. Crypt.* p. 107. WEBER, *Spicil. Fl. Goet.* p. 158. WILLD. *Ber.* p. 343. OEDER, *Enum. Pl. Fl. Dan.* p. 43. VILLARS, IV. p. 926. ROTH, *Germ.* III. p. 411. HOFFMANN, *Germ.* II. p. 91. SCHMIDEL, *Icones.* p. 136. t. 35. RELH. *Cant.* p. 440. HUDS. *Angl.* p. 517. LIGHTF. *Scot.* II. p. 789. LAMARCK, *Encycl. Bot.* III. p. 286. WITH. p. 851. *Engl. Bot.* III. t. 185.

Marsilea media pinguis, pallidè virens, floribus majoribus nigricantibus, ad foliorum latera egredientibus. MICHELI, *Nov. Gen.* p. 5. t. 4. f. 2.

Lichenastrum capitulis oblongis, juxta foliorum divisuras enascentibus. DILL. *Musc.* t. 74. f. 42. (excl. fig. R. S. K.)

Jungermannia fronde foliosâ, lacerâ, ex latere floriferâ. HALL. *Helv.* III. p. 63. n. 1884.

β. ANGUSTIOR; fronde elongatâ, sublineari, simplice vel subpinnatim ramosâ.

HAB. Extremely moist and generally shaded places in marshes; sometimes also, though not frequently, growing under the water in shallow rivulets and stagnant pools.—β is found plentifully at Herringfleet, by Mr. Turner, among *Confervæ* and other aquatic plants, in pools of water.—(The fructification, both male and female, seems to be not uncommon during most of the summer months.)

PLANT usually growing in loose and straggling patches, sometimes, however, compact and clustered.

Roots, a few minute fibres, scattered about various parts of the under side of the plant.

Some specimens I have observed to be quite destitute of them.

Fronde from one to two, and even three inches long in the var. β, procumbent and often imbricating each other, sometimes nearly erect, of an oblong figure, narrowest at the

(*J. pinguis*.)

BRITISH JUNGERMANNIÆ.

base, where they are one or two lines in diameter, thence gradually widening to the extremity, which is rounded and obtuse, and three or four lines in width: they are either simple, or furnished with one or more large divisions or segments, (which, in every respect, resemble the principal part of the frond) and other lesser ones, which give the appearance of a sinuated margin; the whole, though plane, or even a little concave above, is below so swollen, that many individuals are half a line, or even a line in thickness, and are always destitute of any nerve: *substance* carnose, remarkably succulent, opaque: *cellules* numerous, small, and not readily discernible: *color* more or less of a yellow green.

MALE FRUCTIFICATION (f. f. 4. 5. 6) situated in the superior surface of small marginal processes or receptacles, eight or ten or more of which occupy the upper half of a frond; each of these is simple or two-lobed, convex beneath (f. 5), plane above (f. f. 6. 7). In the upper and plane surface, the substance seems to be of a paler color, and more closely cellular than the rest of the plant: the *anthers* are so deeply imbedded, that their apex alone is level with the superficies, and is visible by means of a little opening. They are spherical, reticulated, greyish, situated upon a very short *footstalk*: by the shrinking up of the cuticle, after the discharge of the pollen from the Anthers, the apertures, which they previously filled, are now nearly empty. The receptacles themselves, in all probability, after their office is performed, expand into segments of the frond.

FEMALE FRUCTIFICATION (f. f. 1. 2. 18. 19) originating in various parts of the under side of the plant, but always near the margin.

Calyx (f. f. 18. 19) nearly hemispherical, much resembling that of *J. multifida*, and having an expanded mouth and fimbriated margin: its substance is cellulose, like that of the frond.

Pistilla (f. f. 19. 20) seven or eight in number, small, nearly ovate, with a somewhat dilated mouth, jagged and a little bent back; they are of a greyish color, marked, longitudinally and transversely, with darker lines.

Calyptra (f. 10) three, or even four lines long when arrived at its full size, lineari-oblong, cylindrical, nearly of the same thickness throughout, strait or a little waved and curved at the base, obtuse at the end, sometimes having a short *style*. Its *texture* is succulent, closely cellulose: its *color* a very pale greenish yellow, approaching to white.

Peduncle from two to three inches long, whitish, cellulose.

Capsule oblong, red-brown, marked with numerous striæ or furrows, which are connected by transverse ones. It opens into four equal lanceolate valves, which reach to the base of the capsule, and contain at their apices the

Spiral filaments in the form of tufts or pencils: these are formed of a simple closely-twisted *helix*, attenuated at each extremity, of a fulvous color, as are the seeds, which are, moreover, spherical and smooth*.

The *var. β* has a singular appearance, at first sight, from the narrowness of the fronds, and more so, when it is found branched, from the pinnated disposition of the segments. Some of the smaller individuals are not more than equal to the calyx in size.

* Schmidel, however, seems to have discovered them to be otherwise. "Per lentem summè augmentem ex croceo fusca adparent, formamque sphericam, aliquantùm irregularem, superficiemque venis rotundis reticulatam offerunt." *Icones*, p. 139.

I have already, under *J. multifida*, noticed the characters by which that species may be known from the smaller varieties of *J. pinguis*, which, indeed, in the general outline of the frond, bears a still closer resemblance to *J. epiphylla*: the difficulty of distinguishing these two, will, however, vanish when the greater thinness and far less succulent nature, the larger cellules, more reticulated appearance, and, above all, the nerve of the latter are taken into consideration. The female fructification of the two species is also totally different in its situation, and affords most decisive and never-failing marks of distinction. Dillenius, who was well acquainted with the two in this state, has assuredly fallen into an error, in his tab. 64. f. 42. R. S. and K. where he has represented the antheriferous fronds of *J. epiphylla*; although he has, in the same plate and figure, at the letters T. and U. published a very satisfactory likeness of the true male fructification of *J. pinguis*.

In Schmidel's plate also of *J. pinguis* (*Icones*, tab. 35. f. 1. 6. 7), is figured a Jungermannia, which, not only in the shape of the frond, but also in the tubercles which it bears on its upper surface, has a close resemblance to the anther-bearing specimens of *J. epiphylla*; but the contents of these tubercles, or acervuli, as they are called, are so different from the anthers of *J. epiphylla*, that it is impossible they should be intended for them: their structure, also, is most remarkable, which tempts me to transcribe Schmidel's elaborate description of them, causing, at the same time, no little regret, that it is neither in my power to confirm, by my own observation, so interesting an account, or even to suggest an opinion, as to their probable use. "Maio et Junio, ac sequentibus æstivis mensibus observati cespites in medio disco monstrare solent glomeres seu acervulos, ex basi rotundâ in conicam formam elevatos, modò alternos, modò conjugatos, ex supinâ frondis facie surgentes, totos ex vesiculari laxâque compage conflatos, pro incremento frondis semper sibi succedentes, quo durante, apex rami erigitur et introrsum complicatur; eo verò cessante, ampliari et explanari incipit. Juniores virescunt, in vertice foveolam gerentes: adultiores aut soli, aut cum totâ frondis substantiâ, rubescere plerumque incipiunt. Sensim cuticula seu reticulum foveolæ distenditur, ut contenta in acervulo transpareant. Paulo post liquor comprehensus aut nudus conspicitur, aut pars ejus in vesiculas oblongas, numero octo, novem vel decem extuberat, quæ foveam, coronæ instar, ambiunt; mox tamen sponte cadere non tardant. Vesiculas istas a liquore acervuli proficisci, inde patet, quia semper post vesicularum ortum cavea minus plena reperitur. Liquor ipse densiusculus, non perlucens, sed lactei coloris est, et comprehenditur caveâ uniloculari, ex rotundo oblongâ, in ipsius acervuli gremio exsculptâ, cujus orificium propriâ serie reticuli circumdatur. Aliquâ morâ interjectâ, succus is, aut in moleculas minimas divisus, aut in globuli ovalis reticulati formam conglutinator, exploditur magis, quàm effunditur, vel ad acervuli latera, vel in frondem ipsam. Non autem diu ita restat, sed non ipse solùm, sed et vesiculæ suprâ dictæ propullulantes intra diei decursum vel intra biduum, ut distinctè vidi, sordescunt, diffluunt atque tandem disparent. Quo facto, cavea vacua aliquandiu restat, et tandem cum ipso acervulo decrepito aboletur. Eodem temporis spatio versus apices ramorum noduli aut tubercula occurrunt, in superficie pronâ frondis sita, et supernè transparentia, quæ ex omni verisimilitudine vasculorum primordia sunt, commodissimè tunc fœcundanda."—Then again, after describing the female fructification, he continues: "Rebus ita se habentibus, si liquoris, in acervulis contenti, natura et brevis duratio consideratur, ex omni veri similitudine acervuli organa masculina, et liquor eorum, fœcundans dici merentur. Efficaciâ liquoris istius, eo tempore effusi, quo flosculi vasculiferi primis incunabulis involuti adhuc sunt, tempestivè transferri potest ad loca destinata, non obstante styli brevitate; cùm maxima filorum pars vertici Vasculi inserta reperiatur, cujus rei exempla alia in posterum adhuc occurrent. Ex alterâ parte Granula, concursu plurium structurarum elaborata et disseminata, diuque post dispersionem durantia, pro seminibus, et Flosculi Vasculaque pro

(*J. pinguis*.)

BRITISH JUNGERMANNIÆ.

pro organis femineis optimo jure haberi poterunt. Neque obstaret declarata eorum flexilitas, quæ nil facile aliud nisi parietum teneritatem involvet, et plantis ex merâ fabricâ vesiculari succrescentibus, vix quidquam officiet. Si igitur Vascula Antheræ polliniferæ porro dici volunt, acervuli aut frustra creati sunt, aut verior usus illis adsignandus est eo, quem diximus. Neque enim per glomerulos istos, qui nunquam solvuntur, neque per contenta eorum, quæ citò contabescunt, planta propagabitur, sicuti experimentis cautissimè captis supra evicimus." The same author has remarked, that the *calyptra*, or, as he considered it, the *corolla*, instead of opening at the extremity for the emission of the capsule, is carried up upon it by the elongation of the peduncle. "Cùm etiam corolla, ut vidimus, radicata sit, idè interdùm accidit, subeunte velocius humore aut in frondem, aut pedunculum egressum parantem, aut ubi frondis margines eam non satis arcè firmant: ut corolla ex parte radicosâ frondis solvatur et cum pedunculo, vaginæ instar, attollatur; eum autem ob pondus adpensum ita impediatur, ut rarè notabilem altitudinem nancisci tunc possit." *Icones*. p. 139.

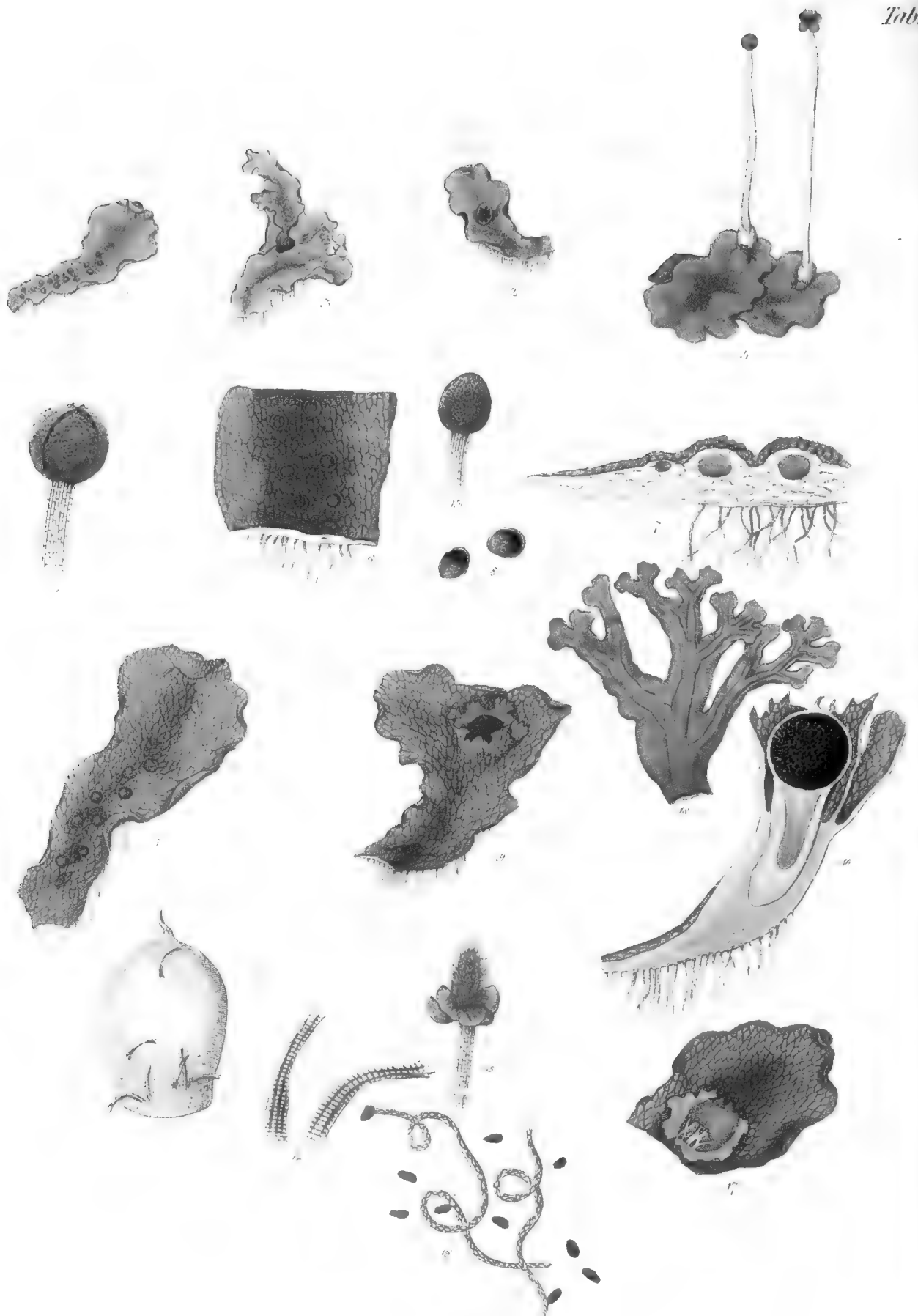
Dillenius has quoted doubtfully the *Hepaticoides palustris Cichorii crispifoliis*, VAILLANT, *Bot. Par. p.* 100. *t.* 19. *f.* 4. as a synonym to the present species. The situation of the fructification, however, in that plant, and the figure of the capsule, prove that it belongs rather to *J. epiphylla*, as Schmidel suspects, and indeed that it can be considered only as a variety of it.

Upon the under side of the fronds of some of the plants which grew under water, were innumerable granules, intermixed with many oblong pellucid bodies, which are represented at f. 9. and are, in all probability, some undescribed animalcules.

REFERENCES TO THE PLATE.

FIG.

1. *J. pinguis*, with female fructification, natural size.
2. *Var. β.* natural size.
3. Under side of *J. pinguis*, natural size.
4. Male plants, natural size.
5. Under side of a male frond. 6
6. Antheriferous receptacle 4
7. The same 3
8. Anthers 2
9. A minute animalcule, which abounds on the plant when it grows in water. 1
10. Calyptræ, entire, and longitudinally dissected 3
11. Young capsule, taken from the calyptra. 3
12. Full grown capsule 3
13. 14. Capsules, with the valves expanded. 4
15. An old capsule, from which the filaments have fallen 3
16. Portion of the valve of a capsule 1
17. Seeds and spiral filaments 1
18. Frond, with young calyces 6
19. Portion of the same, with the calyx dissected, to shew the situation of the pistilla 4
20. Pistilla. 1



Jungmannia epiphylla.
Helium epiphylla (Pers.)

JUNGERMANNIA EPIPHYLLA.

(TAB. XLVII.)

JUNGERMANNIA, fronde oblongâ, submembranaceâ, hîc illîc divisâ, obsoletè costatâ, margine integerrimo, vel sublobato sinuatoque: fructu e superiore parte frondium prope apicem egrediente; calycibus subcylindrâceis, plicatis; ore parùm dilatato inciso-dentato; calyptrâ exsertâ.

Jungermannia epiphylla. LINN. *Sp. Pl.* II. p. 1602. *Syst. Nat.* II. p. 706. *Fl. Suec.* p. 403. LEERS, *Herb.* p. 252. POLLICH, *Palat.* III. p. 200. SCOPOLI, *Carn.* II. p. 350. WEIS, *Plant. Crypt.* p. 106. WEBER, *Spicil. Fl. Goet.* p. 157. WILLD. *Ber.* p. 343. OEDER, *Enum. Pl. Fl. Dan.* p. 43. *Fl. Dan.* t. 359. SCHMIDEL, *Jung. Diss. f. 1.* p. 6. HEDWIG, *Theoria.* p. 83. et seq. t. 21. 22. et 23. SCHREBER, *Spic. Fl. Lips.* p. 110. HOFFMANN, *Germ.* II. p. 92. ROTH, *Germ.* III. p. 410. RELHAN, *Cant.* p. 440. HUDS. *Angl.* p. 517. LIGHTF. *Scot.* II. p. 788. WITH. III. p. 840. LINN. *Syst. Nat. ed Gmel.* II. p. 1353. LAMARCK, *Encycl. Bot.* III. p. 286. LAMARCK, *Fl. Fr. ed. 2. vol. II.* p. 425. *Engl. Bot.* t. 771.

Lichenastrum capitulis rotundis, e foliorum medio enascentibus. RAII *Syn.* p. 110. n. 3.

Marsilea major atro-virens, floribus albicantibus, e foliorum medio egredientibus. MICHELI, *Nov. Gen. Pl.* p. 5. t. 4. f. 1.

Hepaticoides, Hepaticæ facie. VAILLANT, *Bot. Par.* p. 99. n. 1.

Lichenastrum capitulis rotundis, e foliorum medio enascentibus. DILL. *Musc.* t. 74. f. 41.

Jungermannia fronde foliaceâ, obtusè lobatâ, ex medio floriferâ. HALL. *Helv.* III. p. 63. n. 1883.

β. LONGIFOLIA; frondibus elongatis, simplicibus, vel innovationibus solummodò hîc illîc divisîs.

Jungermannia epiphylla β. longifolia. LAMARCK, *Encycl. Bot.* III. p. 286. LAMARCK, *Fl. Fr. ed. 2. v. II.* p. 425.

Jungermannia endiviaefolia. DICKS. *Pl. Crypt. Fasc. IV.* p. 19.

Hepaticoides palustris Cichorii crispî foliis. VAILL. *Bot. Par.* p. 100. n. 8. t. 19. f. 4.

γ. FURCIGERA; frondibus apice innovationibus angustis, dichotomè divisîs; ramis ultimis furcatis.

(*J. epiphylla*.)

BRITISH JUNGERMANNIÆ.

HAB. Moist hedges and shady wet places in various parts of Great Britain, most abundant.
— β . Wet ditches in Yorkshire.—In a field near the orchard, Ballylickey, near Bantry.
Miss Hutchins.—Bog between Castle Malwood Lodge and the Ringwood road, Hampshire.
Mr. Lyell.— γ . Not uncommon in the autumnal and early winter months, in various parts of Suffolk: in the chasm at Cheddar, Somersetshire; and about Torquay and Dartmouth, Devonshire.—*Miss Hutchins* finds it in Ireland, and *Mr. Lyell* in the New Forest, Hampshire.—(Both male and female fructification are produced in the spring and autumn.)

PLANT growing generally in very large patches of some feet in diameter; the individuals imbricating each other, and matted together by means of their radicles.

Roots issuing from nearly the whole length of the nerve on the under side of the frond, composed of small dense simple fibres.

Fronds from one to two, and even four inches in length in the *var. β* ., oblong, or obovato-oblong, at the base always narrowest, simple, or once or twice divided, without any regularity, by short lateral segments, their margin waved, entire, or at most only cut into a few short and very unequal lobes, which are flat or curved; at the extremity of such plants as possess young female fructification a terminal lobe is generally bent down, so as to conceal it (f. f. 1. 5): innovations are sometimes produced, simple and lateral in α and β , in γ terminal, and divided in a dichotomous manner, twice or thrice, with the extremities more or less forked: the whole plant has a wide, and (except when held between the eye and the light) not a very conspicuous nerve. This, in the younger plants, is most evident, and in the innovations in the *var. γ* (f. 18), is at all times very distinct. The *cellules* of the frond are large and ovate: the *color* a deep green, much darker about the nerve, where a purple tinge is also not unfrequent.

MALE FRUCTIFICATION situated in the upper surface of the frond, and always confined to the nerve, in which the *Anthers* are imbedded, a single one beneath a small swelling or tubercle (f. f. 1. 5. 6. 7); each is of a roundish figure, and a greyish color, or in a more advanced state yellow, surrounded by a pellucid limbus. As it is only in a dried specimen that I have yet had the opportunity of examining the *Anthers*, I have been unable, satisfactorily, to distinguish the footstalk, which, in all probability, is extremely short, like that of *J. pinguis*.

FEMALE FRUCTIFICATION upon the same plants with the male, as well as upon different individuals; like it, too, proceeding from the upper side of the nerve, though a swelling may be observed beneath, in the young state of it (f. f. 1. 5).

The *calyx* appears to be formed by the bursting of the frond, which takes place near the extremity, or sometimes near the middle of the plant: what appears at first but an irregular laceration in the frond (f. 17), afterwards becomes a tubular, and somewhat plicated calyx (f. f. 9. 10), varying in length from half a line to a line and a half, having its mouth a little expanded, and toothed in a very evident but irregular manner: in its *color*, and in the form of its *cellules*, it partakes, as may be supposed, of the nature of those of the frond.

Calyptra, when young and enveloping the capsule, of an ovate figure, approaching to round, tipped with a long tubular style, and bearing, on various parts of its surface, abortive pistilla, which, like the style, are tubular, a little expanded at the mouth, and irregularly toothed: throughout their whole length, they are marked with reddish lines, and have also numerous transverse striæ. When it has reached its full size, the calyptra is of an

BRITISH JUNGERMANNIÆ.

(*J. epiphylla*.)

oblong shape, and in length, twice or thrice exceeds that of the calyx. Its texture is very thick, carnose, and closely cellulose; its color a dirty white (f. f. 11. 12).

Peduncle from two to four inches long, whitish, cellulose, tipped with the almost spherical *Capsule* (f. f. 13. 14. 15), which is of a pale greyish-brown color, and opens into four equal ovate valves: these soon become recurved, and exhibit the

Spiral filaments, intermixed with the *seeds*, attached to the inner base of the capsule, in the form of a beautiful tuft or pencil (f. 15). The former are extremely long, much twisted, composed of a double *helix*, and enclosed within a pellucid, capillary tube. Their color is a pale reddish-brown; that of the *seeds*, which are of an irregular but more or less oblong figure, is an olive-green, inclining to yellow.

The var. *β longifolia* has the frond greatly lengthened out, so as not unfrequently to exceed three or four inches, whilst its width is scarcely more than as many lines. So crowded is it in its mode of growth, that it becomes erect in some situations. It is more delicate in its texture than *α*, and has its margin more frequently formed into lobes, in the sinuses of which, Mr. Lyell has remarked dark marks, whence have been produced lateral and undivided innovations, about half or three quarters of an inch in length, exactly resembling the parent frond.

γ furcigera appears to be most abundant in the autumnal months, when the apices of the fronds are produced in a very remarkable manner; forming innovations, or, perhaps, more properly speaking, branched elongations, which are considerably more narrow, and of a paler green than the rest of the frond, and have the ultimate branches always more or less forked. As I have already observed, the nerve is here at all times very conspicuous, disappearing only immediately below the extremities of the divisions. In the month of March, I have lately remarked, on plants of this description, that the branches become wider, and of a deeper color, and that they gradually partake more of the usual appearance of the plant: roots descend from their under sides, and the old fronds seem to be going into a state of decay; so that these curious processes are, in all probability, destined by nature as a means of increasing the species, different from any that has yet been noticed in the other *Jungermanniæ*.

Of the present species, Vaillant was induced to consider, what I have above described as the elongated variety, a distinct plant; and our countryman, Mr. Dickson, has followed him in this particular; an opinion with which I would gladly have coincided, but that, for my own part, I can neither find in the figure of the one, nor in authentic specimens from the other, any characters which will lead me to suppose them other than varieties, and I have consequently thought it best, as Lamarck has already done, to make this appearance the *β* of *epiphylla*. The crisped habit is by no means peculiar to it, and seems only to arise from the situation in which it happened to grow; for, among small loose stones, I have observed our common *J. epiphylla* to have an equally curled or waved frond, in consequence of the unevenness of the surface to which it was attached.

Whatever similarity may exist at first sight between the various species of those British *Jungermanniæ*, which have been termed by botanists, "*frondosæ*," it is certain, that no two of

(*J. epiphylla*.)

BRITISH JUNGERMANNIÆ.

them accord in the important parts of the fructification. With regard to the individual which is the subject of the present description, it is without difficulty distinguished from *J. pinguis* and *J. multifida*, in having a nerve, which, however obscure in some of the old specimens, may in all be seen by holding the plant between the eye and the light, and may be traced on the under side of the plant by the insertion of the roots, since these are confined to the nerve itself. In this respect, indeed, it resembles *J. furcata*, *J. Blasia*, and the beautiful *J. Lyellii*, mss. Yet it is with the latter alone that it can be confounded, and with it only in a barren state: but this is a far more delicate plant than *epiphylla*, is furnished with a very distinct, though narrow, nerve, and has the margin beset with a few scattered teeth.

In the situation of its anthers, *J. epiphylla* differs from every known species; they being placed singly, and immersed in small scattered tubercles upon the upper surface of the nerve, as has been long known by the able descriptions and illustrations, first of Schmidel, and afterwards of Hedwig. The latter author in particular has been so fortunate, as not only to have observed in this species the explosion of the farina from the anther, but to have seen the seeds germinating, and has thus been able to bring forward the strongest arguments in favor of his own system. Speaking of the little bodies imbedded in the tubercles, "Antheras hæc esse," he says, "dubitare nullus poteram. Quo verò earum conformationem et structuram eo distinctius extricarem, auferebam, consueto mihi more, particulam sectione perpendiculari utrinque secundum longitudinem per aliquot horum punctulorum ductâ. Hanc aquæ guttulæ in lamellâ vitreâ immitto, ut si notatû digniora adparerent, delineationi conservarem. Lætus animadverto apparatus, tab. xviii. a. fig. 3. expressum cum suis tribus folliculis, massâ levissimè granulosâ onustis. Atque en, singularis fortunæ favor: inter delineandum scaturire de illo folliculo *b*, per superinductum superficiæ vesiculosum opus cuticulæ, incipit massa granulata, eandem in figuram ac ibi delineata habetur. Persistebat in eâ duorum circiter minutorum intervallo: postmodum verò anteriora versus, nimirum *a. a.* ejusdem figuræ inclinare incipiens, brevi distrahebantur particulæ motu vivo. Testimonio adeoque demum, contra asexualistas, quam evidentissimo, nequidem his deficere sua mascula organa."

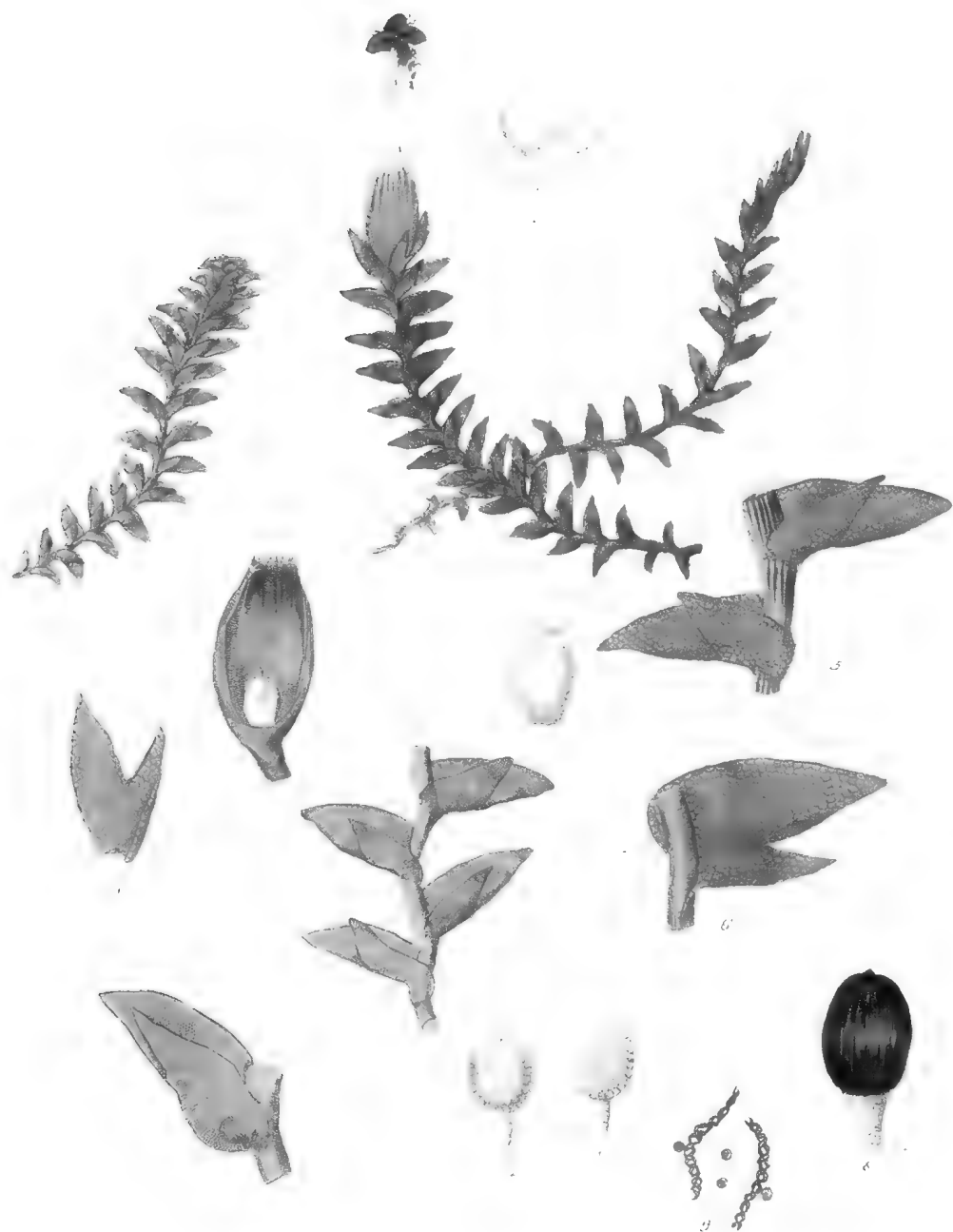
With regard to the germination of the seeds of *J. epiphylla*, the same author remarks, "Anno 1780, mense Aprilis, cum Jungermanniæ seminulis ovatis, viridibus, extremitate alterâ angustiore, dilucidiorè, sationis feci aliquod periculum, in testulâ terrâ repletâ adaptatâque huic experimento: inspergebam superficiæ pulvillum capsularum et felicissimo cum successu. Intumescebant ista seminula post aliquot dies; deinde a dilutiore extremo prodibat radícula simplex, alba, pellucidissima. Reticulata primi incrementi fabrica, subinde in perfectas plantulas ultrò expandebantur. Sic et de his certius constat: pulverem capsularum semina esse vera, fæturâ antherarum vivificata."

REFERENCES TO THE PLATE.

FIG.

1. <i>J. epiphylla</i> , with male and young female fructification, natural size.	
2. Female plant, with a young calyx, natural size.	
3. Female plants, with a calyx fully formed, natural size.	
4. Female plants, with perfect capsules, natural size.	
5. No. 1. magnified	6
6. Portion of the same, containing the anthers	5
7. Transverse section of the same	3
8. Anthers	1
9. Portion of No. 3. magnified	6
10. Longitudinal section of the same	4
11. Young calyptra	3
12. Abortive pistilla	1
13. Capsule	4
14. Capsule, about to open	3
15. Capsule, with the valves expanded, shewing the insertion of the spiral filaments	4
16. Seeds and spiral filaments	1
17. Portion of a frond, with a young calyx and pistilla.....	4
18. Portion of the var. γ	5

3. 2. 2.



Jungermannia Dicksoni.

JUNGERMANNIA DICKSONI.

(TAB. XLVIII.)

JUNGERMANNIA, caule ascendente, subsimplice: foliis bifariis, inæqualitèr bilobis; lobis conduplicatis, inferioribus majoribus, utrisque angustè ovatis, subintegerrimis, acutis: fructu terminali; calycibus ovatis, plicatis; ore contracto, dentato.

HAB. Found many years since in Scotland by *Mr. Dickson*.—On the Castle-Hill, Kinnordy, Kerrie-muir, most abundant, producing anthers and capsules in August. *Mr. Lyell*.—Mountains about Dublin. *Dr. Taylor*.

PLANT growing in small and densely-matted tufts.

Roots a few minute, whitish, simple, fibres, proceeding from near the base of the stem.

Stems from a quarter of an inch to almost half an inch in length, filiform, slightly flexuose, at the base mostly a little procumbent, in the rest of the plant erect, undivided, or sometimes, though rarely, bearing a simple branch or innovation: the *color* partakes of that of the leaves: the *texture* is, in the upper part, tender and cellulose, below more compact; somewhat brittle when dry.

Leaves (f. f. 4, 5, 6) more or less closely placed in a bifarious manner, patent or horizontal, towards the apex of the plant frequently secund, about a quarter of a line long, deeply divided into two unequal conduplicate lobes or segments, of which the inferior is about twice the size of the superior; but both of the same figure, narrowly ovate, with acute apices; their margins are entire, or only slightly, and principally in the upper leaves, irregularly toothed. Their general *color* is a yellow-green approaching to olive, in shady situations of a more uniform green; the lower leaves mostly incline to a dirty brown. The *cellules* are small, roundish, of an equal size throughout.

(*J. Dicksoni.*)

BRITISH JUNGERMANNIÆ.

Perigonial leaves (f. 10) more closely placed than the rest, with which they are intermixed, and are scarcely different in figure, except in having their base swollen for the reception of the anthers.

The *Perichætal leaves* (f. 7) also much resemble the cauline ones: they are erect and embrace the lower part of the calyx with their segments.

MALE FRUCTIFICATION situated in the axillæ of the perigonial leaves; in each of which are placed two or three, nearly spherical, reticulated *anthers*, each supported by a white transversely striated *footstalk*, which is about equal to the anther in length.

FEMALE FRUCTIFICATION terminal.

Calyx (f. 3) half a line long, ovate, longitudinally plicated, the *mouth* a little contracted and toothed; in *texture* it nearly resembles that of the leaves, as does the *color* also, except that towards the mouth it becomes white, and, as it were, scariose.

Calyptra (f. f. 3. 9) small, ovate, of a delicate membranaceous texture, reticulated; *style* short.

Peduncle two or three lines long, white, succulent, cellulose.

Capsule ovate, approaching to round, both longitudinally and transversely furrowed, and remarkable for being of a pale, and rather bright red color. The four valves are ovate, and of an equal size.

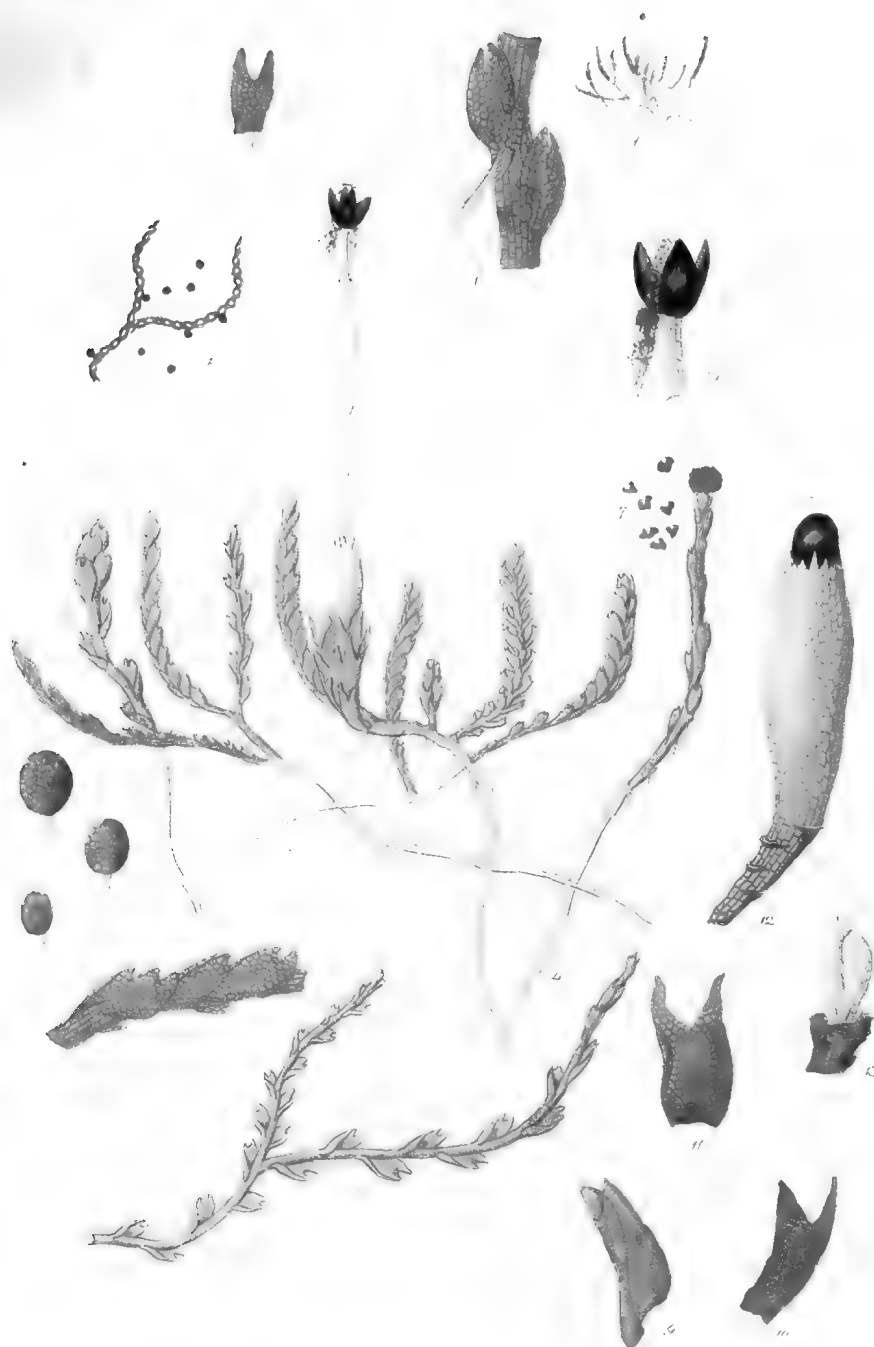
Seeds and spiral filaments (f. 9) fulvous, approaching to red: the former spherical, the latter short and composed of a double *helix*.

There are few naturalists to whom Cryptogamic Botany is more indebted than to Mr. Dickson. In the genus *Jungermannia* his numerous additions to the list of the British species are well known. The present is one of many collected since the publication of the fourth fasciculus of his *Plantæ Cryptogamicæ*, in the Highland Mountains of Scotland, which he kindly communicated to me; and I have great pleasure in distinguishing it by his name. I have already noticed it under the descriptions of *J. albicans* and *J. obtusifolia*, next to which it most naturally ranges, differing from both in the ovate and sharp segments of the leaves, which are quite destitute of any appearance of a nerve. The pale red color of the capsule affords a very obvious and striking mark, when the plant is in a forward state of fructification. The greater part of the annexed figure was drawn from Mr. Dickson's original specimens, but the male and female fructification have been added from others lately gathered by Mr. Lyell, who alone has found the plant in that state. I ought to remark that, in general, the individuals collected by the latter gentleman have their leaves more crowded than appears from the plate, though, in other respects, they exactly agree with Mr. Dickson's specimens, as do, in every particular, those gathered by Dr. Taylor.

REFERENCES TO THE PLATE.

FIG.

1.	<i>J. Dicksoni</i> , natural size.	
2.	The same, a barren and fertile plant, magnified	6
2*.	Male plant	6
3.	Calyx, longitudinally dissected	4
4.	Portion of the stem with leaves	4
5.	The same	3
6.	A single leaf, with the lobes expanded	2
7.	Perichætial leaf	3
8.	Capsule	2
9.	Seeds and spiral filaments	1
10.	Perichætial leaf, containing the anthers	3
11.	Anther	1
12.	Anther, after the pollen has been discharged	1



Sargassum francisci
Sargassum francisci

JUNGERMANNIA FRANCISCI.

(TAB. XLIX.)

JUNGERMANNIA, surculo erectiusculo, simplice vel ramoso: foliis suberectis, ovatis, concavis, acutè emarginatis; stipulis minutis, ovatis, bifidis: fructu in ramis propriis brevibus terminali; calycibus oblongo-cylindræis, parùm plicatis; ore dentato.

Jungermannia bifida. SCHMIDEL, *Icones.* p. 244. t. 62. f. 19. 20? (*planta gemmifera*); et p. 250. t. 64. f. 2? (*planta capsulifera*.)

HAB. About Holt and Edgefield, Norfolk. *Rev. R. B. Francis.*—New Forest, Hants. *Mr. Lyell.*—About Bantry, Ireland, together with *J. Turner*. *Miss Hutchins.*—In moist places upon the ground near the Decoy, Herringfleet, Suffolk. (It produces fructification, both male and female, in the spring and early summer months.)

PLANT growing in small and rather densely-crowded patches of a pale green color, with, very frequently, a tinge of purple.

Root consisting of a few minute, simple fibres, which originate at various distances from the under side of the plant*.

Surculi seldom exceeding five or six lines in length, slender, filiform, or only a little incrassated upwards, flexuose, the lower part simple, usually bare of leaves, pellucid, and of a whitish color, the rest either simple, or once or twice divided with filiform branches, which are generally erect, but occasionally procumbent, of a pale yellowish green color, now and then tinged with purple at their extremities.

Leaves (f. f. 6. 7) small in proportion to the diameter of the stem, growing in a bifarious manner, alternate, more or less closely placed, usually a little imbricated, either erect or erecto-patent, about the sixth of a line in length, ovate, concave, from the apex acutely cleft for about one fourth of their length, into two equal, and somewhat obtuse, segments. The *substance* is, for so small a plant, subcarnose; the *cellules* roundish; the *color* a pale green, inclining to purple in those leaves which are most exposed to the light and air:

* *Mr. Lyell* discovered a single specimen with a larger solitary radicle, much resembling that of *J. Sphagni*.

(*J. Francisci.*)

BRITISH JUNGERMANNIÆ.

Perigonal leaves (f. 2) no otherwise different from the rest, than in being more concave and more closely appressed or imbricated one over another, so that the extremities of the branches, where they are found, are incrassated, which renders them the more readily discoverable.

Perichatral leaves (f. f. 3. 9. 10. 11) seven or eight in number, increasing in size from the base of the fruit-bearing ramulus, where they scarcely exceed the common cauline leaves, to the insertion of the calyx, where they are twice or thrice their length; imbricated on every side; their figure oblong, approaching to quadrate, concave, or, perhaps, more correctly speaking, semicylindrical (f. f. 9. 10); at the apex, they have a deep and wide notch, of which the segments are acute and not unfrequently divaricated, waved, or even recurved.

Stipules (f. f. 7. 8) small, scarcely more than one third of the size of the leaf, plane, and either appressed, or projecting a little from the stem: their form is ovate, and they are divided at the extremity by an acute sinus into two rather sharp segments, which in length are about equal to one third of that of the stipule.

MALE FRUCTIFICATION situated in the axillæ of the perigonal leaves: *Anthers* (f. 16) generally found singly, sometimes two together, nearly spherical, of a pale greenish ash color; in a young state faintly, at an advanced period more evidently, marked with reticulations: The *footstalk* white, semipellucid, transversely striated.

FEMALE FRUCTIFICATION terminal upon the proper footstalks.

Calyx (f. 12) nearly half a line in length, oblong, a little attenuated at the base, and slightly narrowed upward, where it is longitudinally plicated: the *mouth* small, and evidently toothed. In *texture* it resembles the leaves, as it does in *color*, though it is often of a paler tint.

Calyptra (f. 13) ovate, whitish, delicate, furnished with a short *style*. It opens with a vertical fissure for the emission of the capsule: its base is surrounded by a few *barren pistilla*.

Peduncle about four lines long, white, cellulose.

Capsule (f. 14) small, ovate, brown, splitting into four, equal, ovate valves.

Seeds and spiral filaments (f. 15) fulvous; the former spherical; the latter formed of a double *helix*, rather closely twisted.

Gemmæ (f. 4) are found at the same season of the year with the male and female fructification: the *surculi*, at the naked apex of which they are produced, have their leaves smaller and more distantly placed, as well as more erect and appressed, than is usual with the fructiferous individuals. They are collected in minute, rather compact spherical masses, so that, in this respect, as well as in their situation, they resemble those of *J. bicuspidata* and *J. Trichomanis*. Each particle is pellucid, of a greenish color, and angular (f. 17).

Under my description of *J. byssacea*, (TAB. XII.) I first noticed this plant, which I had some reason to think might be the same as that which is figured by Schmidel, in his *Icones*, t. 62. 20. f. 2. and t. 64. f. 2. But those representations are too imperfect to enable me to decide with any degree of certainty, and the important distinguishing character, the bifid stipule, seems to have no existence there. I have, therefore, considered it best to quote the Schmidelian plant with a mark of doubt, and I gladly take the opportunity of distinguishing the present by the name of its discoverer, my friend, the Rev. R. B. Francis, who has so successfully investigated the vicinity of his own residence in search of the plants of this genus, and has so kindly and liberally communicated to me numerous specimens, and much valuable information respecting them.

In habit, *J. Francisci* certainly approaches *J. byssacea*, as well as small varieties of *J. bicuspidata*; but the upright growth of the surculi, and the more concave and less deeply notched leaves are of themselves sufficient marks of discrimination; and when the presence of the stipules is taken into consideration, no difficulty in distinguishing them will be found to occur.

With regard to the stipulated species, among which it ranks, I am unable to mention any to which it bears such a similarity as to render it necessary for me here to notice the points in which they differ.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. Francisci</i> , natural size.	
2. Male plant, magnified.	6
3. Female plant.	6
4. Gemmiferous plant.	6
5. Barren plant.	6
6. Portion of the stem.	4
7. View of the under side of the stem.	4
8. Stipule.	3
9. 10. 11. Perichæatial leaves.	3
12. Calyx.	3
13. Calyptra.	3
14. Capsule.	3
15. Seeds and spiral filaments.	1
16. Anthers.	1
17. Gemmæ.	1

1. The first part of the report is a general introduction to the subject of the study.

2. The second part of the report is a detailed description of the methods used in the study.

3. The third part of the report is a discussion of the results of the study.

4. The fourth part of the report is a conclusion and a list of references.

5. The fifth part of the report is a list of appendices.

6. The sixth part of the report is a list of figures and tables.

7. The seventh part of the report is a list of footnotes.

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67. The sixty-seventh part of the report is a list of footnotes.

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69. The sixty-ninth part of the report is a list of appendices.

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71. The seventy-first part of the report is a list of footnotes.

72. The seventy-second part of the report is a list of references.

73. The seventy-third part of the report is a list of appendices.

74. The seventy-fourth part of the report is a list of figures and tables.

75. The seventy-fifth part of the report is a list of footnotes.

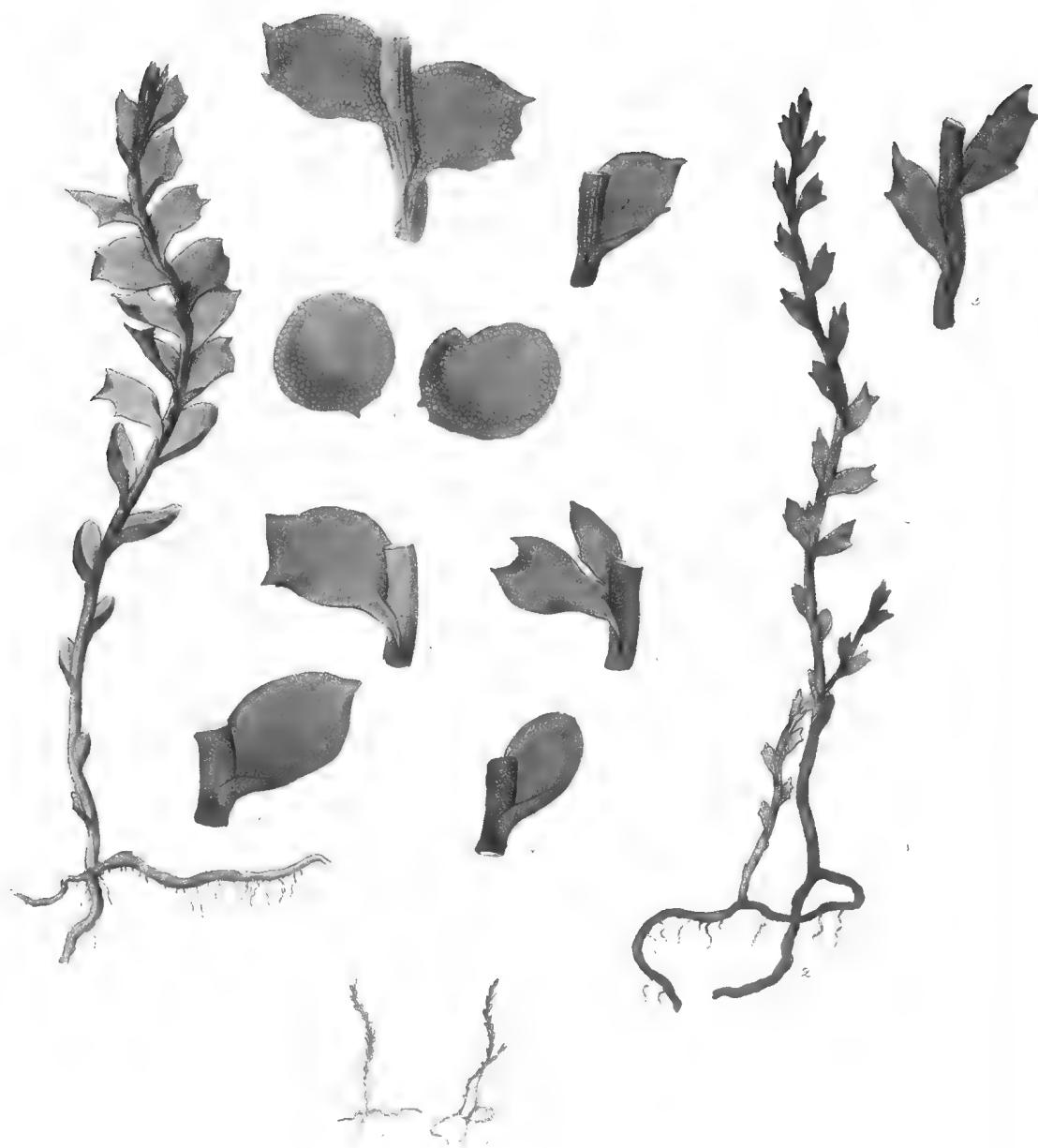
76. The seventy-sixth part of the report is a list of references.

77. The seventy-seventh part of the report is a list of appendices.

78. The seventy-eighth part of the report is a list of figures and tables.

79. The seventy-ninth part of the report is a list of footnotes.

80. The eightieth part of the report is a list of references.



Juncus germanica decipiens.

Juncus germanica decipiens var. *decipiens*

JUNGERMANNIA DECIPIENS.

(TAB. L.)

JUNGERMANNIA, surculo erecto, flexuoso, subsimplicé: foliis inferioribus minoribus, ovatis, integerimis; superioribus rotundato-ovatis, seu subquadratis, dente uno alterove, sparso, spiniformi.

HAB. Rocks on heathy places about Bantry. *Miss Hutchins.*

PLANT growing in dense tufts of small size.

Root large, creeping, of a ligneous texture and brown color, throwing out here and there small opaque fibres.

Stems erect, filiform, flexuose, from half an inch to an inch and a half in height, and about the thickness of horse-hair, simple or rarely divided at the base: sometimes, however, two or more arise from the creeping root: they are of a rigid and somewhat brittle texture; below of a dark brown color, and opaque; above of an olive-green, and evidently cellular.

Leaves alternately and rather distantly disposed in a bifarious manner: those at the base smallest, most widely placed, not more than a quarter of a line long, ovate and concave, with entire margins, and either appressed to the stem or erecto-patent: the rest are considerably larger, though they frequently again diminish in size as they approach the extremity, and are of a roundish or even a subquadrate figure, patent, and sometimes recurved, as in *J. spinulosa* and *J. asplenoides*; their base is decurrent; their margins furnished with one, or often two or three large, and, at their base, broad, spiniform teeth; but these are placed in so irregular a manner, and at such uncertain distances, that it is not possible to find two that precisely agree in this particular. A common appearance of the lower leaves is given at *f.* 10: *f.* 4 is a portion of the stem, of which one leaf has two, and the other three, teeth at the apex: *f.* 5 has an acute tooth at the extremity, and another lateral one: *f.* 6 represents two leaves, the one having its margins entire, the other furnished with an obtuse, lateral tooth, which is not of common occurrence: *f.* 7 has two divaricating teeth at the apex: *f.* 8 is cut into two unequal lobes, (which may probably have been the effect of accident) the one having two terminal teeth, the other,

(*J. decipiens*.)

BRITISH JUNGERMANNIÆ.

one terminal, and a minute lateral one; whilst, at *f. 9*, an ovate leaf is tipped with a single tooth. The *texture* of the leaves is somewhat rigid, and, like the stem, when dry, of a brittle nature. The *cellules* are of a rounded figure, except at the margin, where their larger and more quadrate shape forms an evident border to the leaf.

No fructification has hitherto been discovered upon the present species by the indefatigable lady to whom we are solely indebted for our knowledge of it: a circumstance that is the less to be regretted, since there are sufficient characters in the foliage to distinguish it both from *J. asplenoides* and *J. spinulosa*, its nearest affinities. Nor does it, however mutable in the shape of its leaves, appear to be subject to any variation of a nature to cause it to be confounded with others; for Miss Hutchins remarks, "I have watched it very attentively for three years past, and could not observe any alteration. I at first thought it might be a variety of *J. spinulosa*, but now I am pretty sure it is distinct."

REFERENCES TO THE PLATE.

FIG.

1. *J. decipiens*, natural size.
 2. 2. The same, magnified 6
 3. Portion of the stem 4
 - 4—10. Various figures of leaves from the same individual..... 4 and 3
-

JUNGERMANNIA HAMATIFOLIA.

(TAB. LI.)

JUNGERMANNIA, surculo repente, filiformi, flexuoso, vagè ramoso; foliis distichis, bilobis; lobis inæqualibus, superioribus majoribus, ovatis, acuminatis, apice sæpissimè curvatis; inferioribus involutis: stipulis ovatis, acutè bifidis: fructu laterali; calycibus obovatis, pentagonis; ore contracto, elevato, dentato.

β. ECHINATA; foliis elegantissimè echinatis.

HAB. Rocks upon Ingleborough, Yorkshire; and in the Den of Rechip, near Dunkeld.—About Bantry, upon the stems of *Ulex nana*, and in other situations in that neighborhood, frequently intermixed with *J. calyptrifolia*. *Miss Hutchins.*—*Mr. Lyell* also finds it growing with the same species near Keswick, Cumberland.—On heath in the county of Kerry. *Dr. Taylor.*—β. was discovered upon the trunks of trees at Torquay, Devonshire; and has likewise been found at Woodlands, near Dublin, by *Dr. Taylor.*—(Its fructification, both male and female, is produced in the early spring months.)

PLANT growing in small, crowded, green patches, appearing to the naked eye like clusters of minute granules.

Roots very small, whitish fibres, distantly scattered, as in *J. serpyllifolia*, along the under side of the stem; not unfrequently issuing in little bundles from near the base of the stipules.

Surculi from two or three lines to half an inch in length, extremely slender, filiform, flexuose, procumbent, lying over each other in an imbricated manner, or creeping in a less clustered form. Each individual is irregularly once or twice divided in a subdichotomous manner, the segments varying much in their length, as well as in their direction. The *texture* is delicate, composed of oblong cellules: the *color* a pale green.

Leaves (f. f. 5. 6. 7) rather closely placed, though seldom so much so as to be imbricated, bifarious and alternate, erecto-patent with regard to the stem, formed of two unequal portions, or lobes, of which the upper one is the largest, yet scarcely exceeding the tenth

(*J. hamatifolia*.)

BRITISH JUNGERMANNIÆ.

of a line in length, very convex on its superior surface, of an ovate figure, acuminate at the extremity, where it is often curved in various directions, but usually downward: the margins are either entire (f. 5), or serrated (f. f. 4. 7), a circumstance that varies much in different individuals, and even on the same shoot, though the former appearance is the most common: the lower lobe is about half the size of the upper, which it resembles in shape, and is remarkably involute, having its margins sometimes, though rarely, very slightly serrated. The *substance* of the leaves is rather thick and subcarnose for so small a plant; the *cellules* small, round, a little prominent. The *color* pale green.

Perigonial leaves generally to be found at the extremity of a surculus, scarcely differing from the rest, except in being ventricose at their base, and placed in a more crowded and somewhat imbricated manner.

Perichæatial leaves (f. f. 3. 4. 9. 10) almost twice the size of the cauline ones; two attached to each calyx, the base of which they embrace: They are ovate, approaching to round, nearly plane, divided, for about one half of their length, into two, ovate, but unequal, upright, acute segments or lobes, of which the margins are sometimes entire, but more frequently elegantly and very conspicuously serrated (f. f. 9. 10.)

Stipules (f. f. 7. 8) small, ovate, acutely cleft for nearly half their length into two sharp, equal segments, which appear to be always entire at their margins.

MALE FRUCTIFICATION; a single spherical *Anther*, situated in the axilla of each perigonial leaf; it is faintly reticulated, of a pale yellowish ash color: the *footstalk* is white, pellucid, and transversely striated.

FEMALE FRUCTIFICATION lateral.

Calyx more than a quarter of a line long, ovate or obovate, often attenuated at the base, distinctly ribbed with five prominent and acute angles, reaching from the extremity nearly to the base; these are either entire (as at f. 10), or strongly serrated (as at f. 3). The *mouth* is much contracted, and generally also elevated and tubular, cut into many fine and sharp teeth.

Germen (f. 11) ovate, contracted at the base; *style* rather long, tubular.

Calyptra (f. 12) ovate, whitish, reticulated.

Peduncle scarcely exceeding the length of the calyx more than half a line, divided, by means of transverse septa, into short joints, which again appear striated longitudinally, in consequence of the numerous narrow, and tubular *cellules* of which they are composed.

Capsule exactly spherical, white, pellucid, membranous, reticulated, opening into four equal segments, or valves, which are only half as long as the capsule, and at their apices support the

Spiral filaments, adhering to them by their bases: each composed of a double *helix*, slightly twisted, and enclosed in a pellucid tubular membrane. The *seeds*, though by no means exactly spherical, are more so than those of *J. calyptrifolia* and *J. serpyllifolia*, and are of a green color, inclining to olive.

The leaves of *var. β* present under the microscope a highly-beautiful and singular appearance; for each cellule, upon their surface and margin, which in the common state of the plant is, at most, convex or slightly prominent, is here so much so, and so acuminate as to appear altogether echinated; a peculiarity that is not confined to the cauline leaves, but extends to the perichæatial ones, and to the calyx. The cellules of the stems, too, are more than usually convex.

(The same minute, nearly spherical, reticulated bodies (f. 13), which, under the description of *J. calyptrifolia*, I have called *Gemma*, are also abundant upon the present species, but I am unable to discover how they are attached to it.)

In my remarks on *J. serpyllifolia*, I have noticed the affinity which the present plant bears to the *var. β* of that species, and, in addition to the observations I there offered, I have only to add, that this is much smaller in all its parts; that the size of the lobule, both in the cauline and perichæatial leaves, bears a much greater proportion to that of the lobe; that the texture is thicker and more succulent, the calyx narrower, and the stipules more ovate.

J. hamatifolia is probably not a rare inhabitant of the subalpine parts of the British isles; but an experienced botanist, without the assistance of a microscope, would scarcely be able to distinguish it, in its native place of growth, from *J. minutissima*, although on a more minute examination, the leaves will be found to possess a widely different character.

I have to regret that the Anthers, and a more perfect state of the capsule, as well as the *var. β*, were discovered too late to have them inserted in the annexed plate.

A minute, reddish, globular body (f. 6) is not unfrequent in the axillæ of the leaves, and may at first sight be readily mistaken for an Anther; but it is pellucid, always destitute of a footstalk, and has rather the appearance of an animal than a vegetable substance.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. hamatifolia</i> , natural size.	
2. Portion of the same, magnified	6
3. Fructified portion of the stem	4
4. The same, with serrated leaves	5
5. Cauline leaves	3
6. Cauline leaf, with an animalcule (?) in its axilla	3
7. Under side of a portion of the stem, shewing the stipules	5
8. Stipule	4
9. Perichæatial leaves	4
10. Calyx and perichæatial leaves	4
11. Germen	2
12. Calyptra	1
13. Gemmæ	1
14. Seeds	1



Jungmannia minutissima.
Microlejeunea ulicina (Tayl) Evans

JUNGERMANNIA MINUTISSIMA.

(TAB. LII.)

JUNGERMANNIA, surculo repente, filiformi, flexuoso, vagè ramoso: foliis distichis, ovato-rotundatis, suprà valdè convexis, hìc illic lateralitèr subemarginatis, vix bilobis: stipulis ovato-rotundatis, bifidis: fructu laterali; calycibus obovato-rotundatis, pentagonis; ore contracto, parùm dentato.

Jungermannia minutissima. Engl. Bot. t. 1633.

Jungermannia omnium minima, seu vix conspicua, Serpylli aut Herniariæ foliis auritis, floribus ex albo virescentibus, vaginâ cordiformi. MICHELI, Nov. Gen. p. 9. t. 6. f. 20.

Lichenastrum, quod Jungermannia omnium minima, seu vix conspicua, Serpylli aut Herniariæ foliis auritis, floribus ex albo virescentibus, vaginâ cordiformi. DILL. Musc. t. 72. f. 29.

HAB. First discovered in this country by Mr. Lyell, growing on the bark of holly and ash trees, near the ground, in the New Forest; bearing fruit in April and May: afterwards found by the same gentleman more plentifully near Keswick, Cumberland, and upon fir trees at Mount Edgecombe, Devonshire.—Upon trees at Henfield, Sussex. Mr. William Borrer.—In the neighbourhood of Bantry, Ireland. Miss Hutchins.—It grows indifferently upon trees and rocks, and is very common in various parts both of Devonshire and Cornwall.—About the lake of Killarney, Ireland, upon the trunks of trees. Sir Thomas Gage, Bart.—Woodlands near Dublin.—Dr. Taylor.

PLANT growing in patches, from one to two or three inches in diameter, appearing, at a little distance, like a green stain, and, even on a nearer approach, it may readily be mistaken for *Lepraria viridis*.

The roots proceed from the under side of the stems and branches, generally immediately at the base of the stipules, and in small, whitish bundles of fibres.

Surculi creeping over each other in an imbricated manner; each individual is from one to two or three lines long, remarkably slender, filiform, branched, with the branches varying in length and direction, simple or again divided. The texture is equally delicate with that of the leaves, composed of distinct, oblong cellules.

(*J. minutissima*.)

BRITISH JUNGERMANNIÆ.

Leaves about the twentieth of a line in length, distantly placed, bifarious, alternate with regard to the stem, patent or erecto-patent, of a roundish-ovate figure, on the upper surface very convex, so as to be almost hemispherical, the margin is frequently altogether entire, sometimes furnished in the lower part with a small, oblique and obtuse notch, which can scarcely be said to constitute an unequally two-lobed leaf; the rest of the margin is wholly free from serratures or incision of any kind. The color is a pale green; the texture thick and succulent; the *cellules* small, roundish, and a little prominent.

Perigonial leaves placed at the extremity of a branch; eight or ten in number, more closely placed than the cauline leaves, but in no other respect do I perceive that they differ from them.

Perichatial leaves (f. f. 2. 4) the tenth of a line long; one pair originate at the base of the calyx to which they are appressed; their figure is widely ovate, concave, divided by a very obtuse and oblique sinus, into two small, unequal, blunt lobes (f. 4).

Stipules (f. 3) small, ovate, approaching to round, furnished at the apex with a deep and sharp notch, forming two equal, acute segments.

The MALE FRUCTIFICATION I have but lately seen: as in *J. hamatifolia*, a single, spherical, reticulated *Anther* is found in each perigonial leaf; the *footstalk* is short, white, transversely striated.

FEMALE FRUCTIFICATION lateral.

Calyx (f. 2) large in proportion to the size of the plant, and thrice the size of the leaf, obovate, inclining to round, its base slightly attenuated; five acute, projecting angles extend from the apex to the base, and these are always entire: the *mouth* is considerably contracted, and slightly toothed. In color and texture the calyx exactly resembles the leaves.

Germen (f. 5) ovate, green: *style* rather long, tubular.

Calyptra (f. 10) ovate, whitish, membranous, reticulated.

Peduncle but little exceeding the calyx in length, white, cellulose, transversely striated, forming nearly quadrate joints, which are again striated longitudinally. Here, too, as in *J. serpyllifolia* and its associates, the peduncle, when dry, is bent at the joints in a zigzag manner.

Capsule (f. 7) precisely spherical, pellucid, white, reticulated, opening into four, equal, acute valves, which are only one half of the length of the capsule (f. 9).

The *spiral filaments* (f. f. 9. 11) are of a brownish color, formed of a double *helix* loosely twisted, enclosed within an extremely delicate tube, and attached by their base to the points of the valves in small pencil-shaped tufts.

The *seeds* are large, oblong, somewhat angular, of a dark green color.

Gemmae (f. 12) spherical, green, reticulated.

BRITISH JUNGERMANNIÆ.

(*J. minutissima*.)

Micheli had the honor of first detecting and describing this most diminutive species of the genus, which Dr. Smith has very aptly named *minutissima*. Italy and Great Britain are the only countries yet known to possess it; though, with us, I think it can hardly be reckoned among the *plantæ rariores*.

In habit, as well as in the more important parts of fructification, (which are such as to furnish characters for a distinct genus) *J. minutissima* precisely accords with *J. serpyllifolia*, *J. calyptrifolia*, and *J. hamatifolia*: the leaves, nevertheless, will be found to differ essentially from those of the individuals now mentioned, in being altogether entire, or at most having so obscure an incision, that no one would consider the plant as belonging to the division "*foliis inæqualitèr bilobis*." Indeed, it seems to hold an intermediate place between that section and the one "*foliis integris*."

The stipules, though, on account of their small size, they are with difficulty detected and have not been noticed by any preceding authors, will, if caution is used, be found to exist throughout the whole length of the lower part of the surculus.

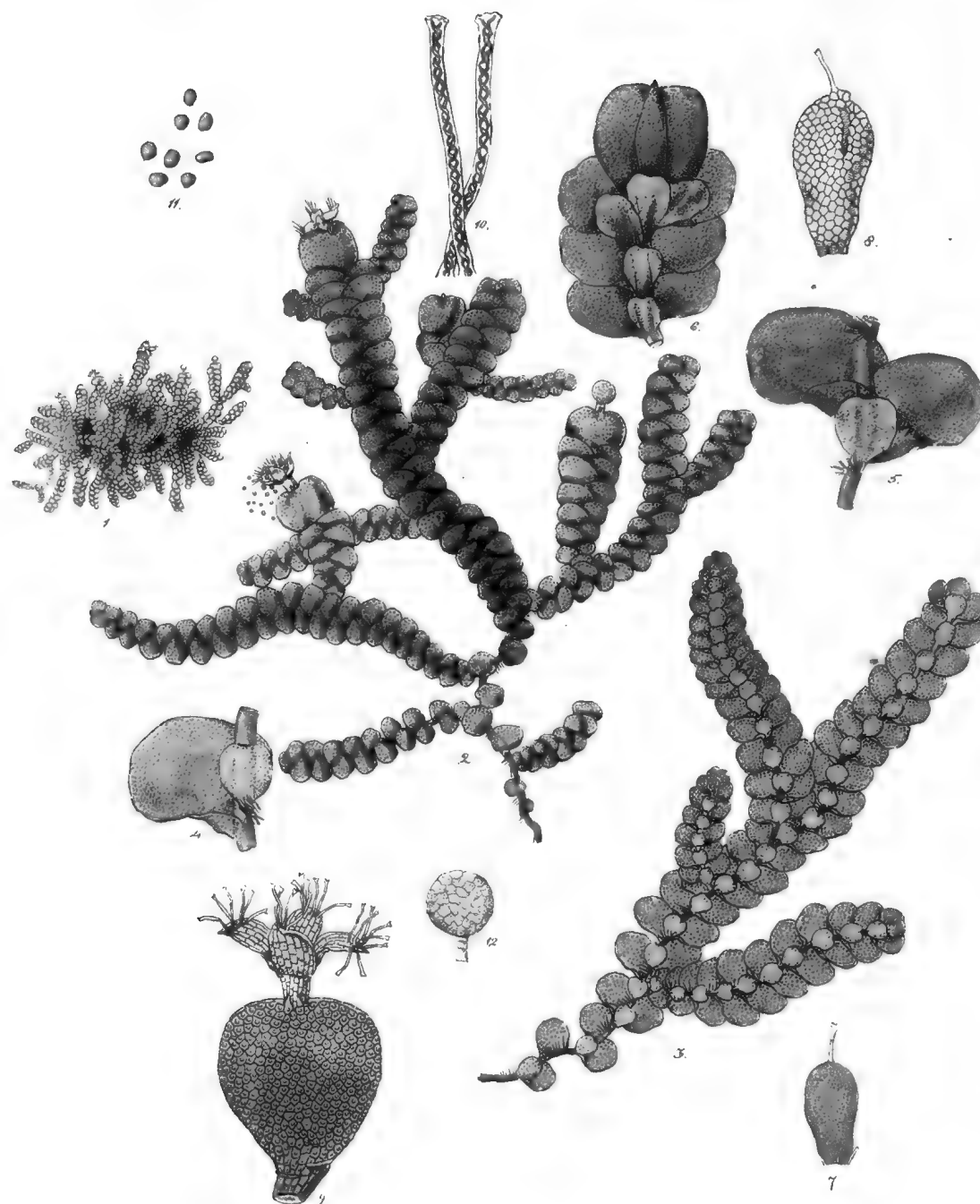
Dillenius' figure and description of this species, as well as those of *J. serpyllifolia*, are, as noticed by that author, copied from Micheli.

REFERENCES TO THE PLATE.

FIG.

1.	<i>J. minutissima</i> , natural size.	
2.	Portion of a fructified stem.....	6
3.	Under-side of a portion of the stem, with a stipule	4
4.	Perichæatial leaves	4
5.	Germen.....	3
6.	Style	1
7.	Capsule bursting.....	3
8.	Seeds.....	1
9.	Capsule with the seeds discharged	2
10.	Calyptra.....	2
11.	Spiral filaments.....	1
12.	Gemmæ.....	1





Jungermannia Mackaii.
(Hb. Mackaii in Gray.)

JUNGERMANNIA MACKAIL.

(TAB. LIII.)

JUNGERMANNIA, surculo repente, vagè ramoso: foliis distichis, imbricatis, bilobis; lobis inæqualibus; superioribus majoribus, rotundatis; inferioribus minutis, involutis: stipulis magnis, rotundatis, obcordatis: fructu laterali terminalique; calycibus obcordatis, depressis, triangularibus; ore contracto, elevato, dentato.

HAB. Sent to me, January, 1812, by *Mr. Mackay*, who observed that he had known the plant to grow at the Dargle, for several years, and that it is not unfrequently mixed with *J. serpyllifolia*.—On wood, stones, and stems of heath, about Ballylicky, near Bantry. *Miss Hutchins*.—Lowdore. *Mr. Lyell*.—Upon rocks at Cheddar, Somersetshire, plentiful; and on the rocky sides of the chasms and vallies in the neighborhood of Torquay; and, indeed, in similar situations throughout the Lime-stone country, in that part of Devon. It occurs more rarely upon schistus, near the water-fall at the Devil's Bridge, Lidford.—*Mr. Lyell* finds it at Mount Edgecombe.—Sometimes it is attached to trees.—(In February and March, the fruit, both male and female, is produced in Devonshire.—In Ireland, *Miss Hutchins* finds capsules in November.)

PLANT growing in dense, blackish-green patches of various dimensions, from one or two inches to as many feet in diameter.

Roots issuing from the lower surface of the stem, and immediately below the stipules, in small bundles, which consist of short, pellucid, fibres.

Stems creeping over each other in successive layers, and closely appressed to the surface upon which they grow: each individual is from half an inch to an inch and a half in length, slender, filiform, flexuose, once or twice branched in an irregular, though somewhat pinnated, manner, the branches very variable in length: the *substance* is rather opaque; the *cellules* sufficiently apparent; the *color* a dirty green, approaching to brown.

Leaves rather closely imbricated in two rows over the whole upper surface of the stem, horizontal, divided into two very unequally-sized lobes, of which the largest is about four tenths of a line in length, smaller as they approach the apex of the barren stem, though the reverse is the case in the fertile ones; of a roundish figure, slightly convex above; the lesser one is scarcely one tenth of its size, involute, and ventricose (f. 4): the *texture* is somewhat firm, the reticulation (as in the calyx represented at fig. 9) formed by

(*J. Mackaii.*)

BRITISH JUNGERMANNIÆ.

roundish areolæ or cellules, and so regular in size, as to give the leaf an extremely beautiful appearance under the microscope. When dry, the whole surface appears to be elegantly punctated, in consequence of the sinking in of the centre of the cellules, and, when saturated afresh, a dark spot may be seen in each cellule, where the coloring matter has been precipitated. The general color of the leaves is an olive-green, more or less dark, frequently approaching to black.

Perigonal leaves (f. 5) more crowded and closely imbricated than the rest, and the lesser lobe is of a somewhat larger size; in which particulars alone they differ.

Perichæatial leaves (f. 6) also bear a close resemblance to the cauline ones, but they are somewhat larger, and are furnished with a lobule nearly equal to one half of the size of the lobe: the latter is appressed to the superior, as the former is to the inferior, surface, of the calyx.

Stipules large, roundish, entire, or more frequently very obtusely notched, when they may truly be called obcordate.

MALE FRUCTIFICATION (f. 5).

Anthers (of which one or two are situated in the axilla of each perigonal leaf) ovate in a younger state, spherical when advanced to their full size, pale grey, reticulated; *footstalk* about half of the length of the Anther, white, transversely striated.

FEMALE FRUCTIFICATION very generally terminal, occasionally lateral.

Calyx (f. 9) about three-fourths of a line long, obcordate, much depressed, especially towards the extremity; besides the two angles on the sides, a third and more obtuse one projects from the under surface, and extends from the base to the apex. (f. 6). The *mouth*, in an early state, appears to be confined to a narrow central tubular apiculus, which may at length be distinctly seen to divide into four acute teeth, and, after the emission of the capsule, a long but narrow opening is to be observed, reaching nearly the whole width of the calyx, (f. 9). In color and texture, I can perceive no difference between it and the leaves.

Germen (f. 7) obovate, pale green, having a long tubular style.

Calyptra of the same form with the *Germen*, of a very thin membranous texture, diaphanous, reticulated. It opens with an irregular vertical fissure for the emission of the capsule.

Peduncle very little indeed exceeding the length of the calyx; sometimes not at all: white, cellulose, cylindrical, a little thickened towards the summit.

Capsule (f. 9) small, exactly spherical, of a delicate texture, less so indeed than that of *J. serpyllifolia*, but more so than those of *J. dilatata* and *Tamarisci*; whitish, so pellucid that a faint tinge of a greenish-brown color is imparted by the seeds within; marked with reticulations. The four ovate valves are equal in size, and the divisions extend to the thickened apex of the peduncle: after the discharge of the seeds they become recurved.

Seeds of an irregular form, but approaching to spherical, smooth, of a dark olive-green color. The *spiral filaments* are brown, formed of a double *helix*, enclosed within a pellucid, tubular membrane, which at the mouth is a little expanded, at the base affixed to the extremity of the inside of the valves, where they are persistent in small tufts, even after the discharge of the seeds.

BRITISH JUNGERMANNIÆ.

(*J. Mackaii*.)

It is to my friend, Mr. J. T. Mackay, of the Botanic garden, Dublin, that we owe our first knowledge of this plant; and to him I am anxious to dedicate it. Since this discovery, indeed, it has been found elsewhere in Ireland, as well as in England; and, in the south-western part of our island, appears to be an abundant species on shaded and moist limestone rocks. In the numerous chasms in the ground, especially near the sea, about Torquay and Babbicombe, in Devonshire, *J. Mackaii* grows in such profusion, as to form a striking feature in the coloring of the perpendicular faces of the rocks: though it is in more exposed situations only that the delicate capsules are to be found, and, even there, not without an accurate examination, on account of their small size.

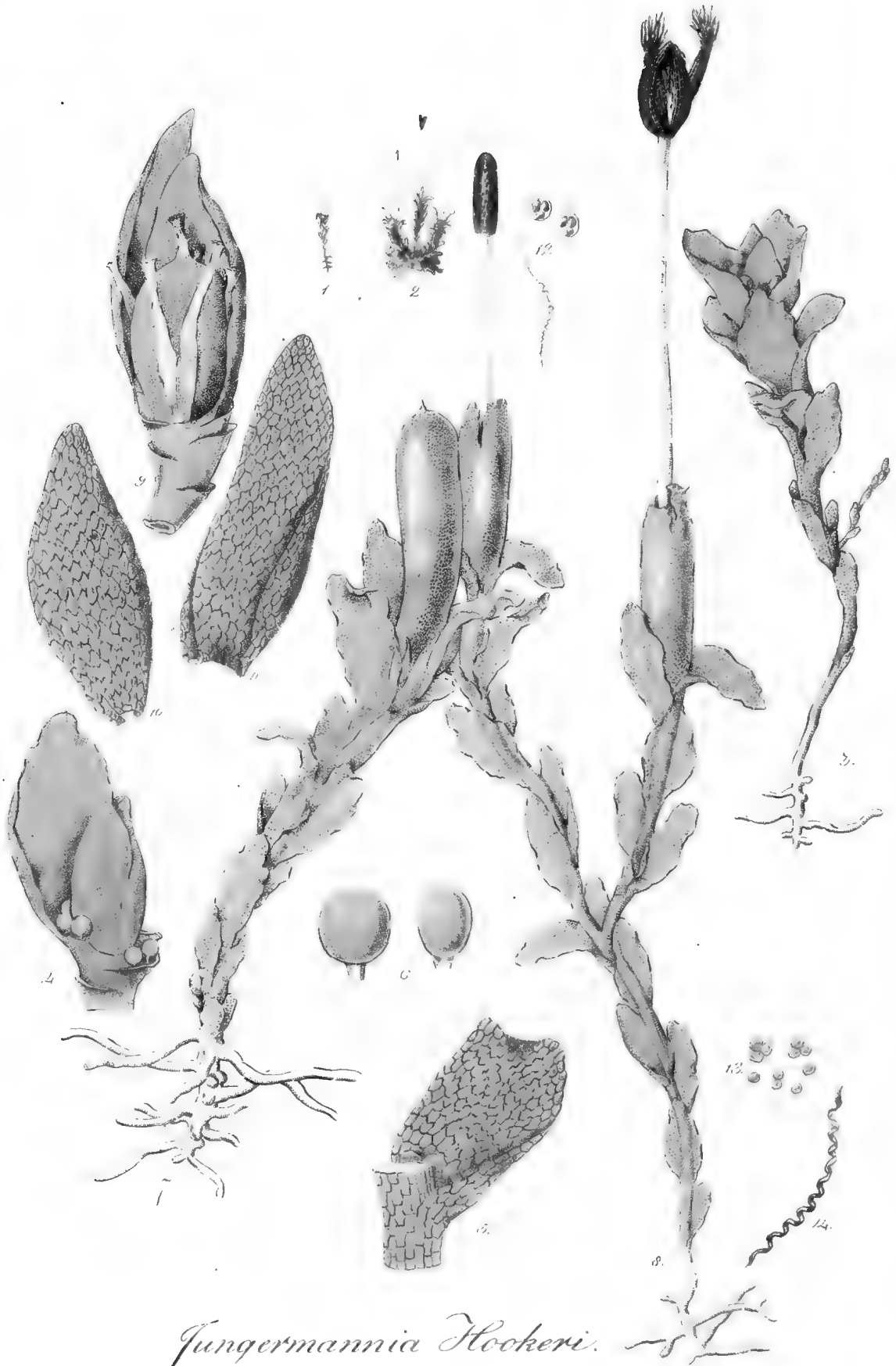
The present species, although abundantly distinct, as well from *J. dilatata* as *J. serpyllifolia*, has, nevertheless, many characters in common with each. The former it approaches in general habit (though, perhaps, it has a still greater affinity in external appearance with *J. complanata*), and in the figure of the calyx; but it differs materially in the conformation of the lesser lobe of the leaf, in the white and delicate texture of the capsule, in the irregularly shaped greenish seeds, and in the double spiral filaments:—in all these particulars, and in the shape of the stipules, it so nearly accords with the latter (*J. serpyllifolia*), that a similarity in the shape of the calyx might not unreasonably be expected. But this is far from being the case; for, in *J. Mackaii*, the calyx is depressed and has three angles; whilst, in *J. serpyllifolia*, it is by no means flattened and is furnished with five angles. This affords a character the most decisive in enabling us to distinguish the two plants; which may be further known, even upon a more casual inspection, by the much greater size, deeper, almost blackish-green, as well as the closer texture of the one (*J. Mackaii*), when contrasted with the minuter foliage, more cellulose structure, and very pale green of the other (*J. serpyllifolia*).

These peculiarities of the last mentioned plant are dwelt upon by Dr. Wahlenberg, in his admirable *Flora Lapponica* (a copy of which I have but lately had the opportunity of seeing), under his *J. cavifolia*; and it is from his having so done, rather than from his figure (in which no fructification is represented), or from his specific character, that I am induced to believe it to be the same as our *J. serpyllifolia*; for both will accord equally well with *J. Mackaii*, as with that species. “Colore,” he says, when speaking of *J. cavifolia*, “lutescente et habitu *J. complanatae* L. convenit, sed surculi triplo angustiores sunt fere in sequenti (*J. trichomane*) specie. Mollis est, et e reticulo grandiori facta.”

REFERENCES TO THE PLATE.

FIG.	
1.	<i>J. Mackaii</i> , natural size.
2.	Female plant, magnified 6
3.	Male plant 6
4.	Leaf and stipule, with a portion of the stem and roots 3
5.	Perigonial leaves 3
6.	Fertile extremity of a branch, shewing the under side of the calyx and } perichæatial leaves } 3
7.	Germen 2
8.	Calyptra 2
9.	Calyx, with a capsule after the discharge of the seeds 2
10.	Spiral filaments, enclosed within their pellucid tube 1
11.	Seeds 1





Jungermannia Hookeri.
Holmii Hookeri (B.) Nees

BRITISH JUNGERMANNIÆ.

(*J. Hookeri.*)

JUNGERMANNIA HOOKERI.

(TAB. LIV.)

JUNGERMANNIA, caule erecto, subramoso: foliis undique imbricatis, ovatis vel oblongo-ovatis, hic illic lobatis angulatisve: fructu terminali; calyce nullo; calyptrâ magnâ, oblongâ, carnosâ, lævi.

J. Hookeri. *Engl. Bot. t.* 2555.

HAB. Growing, intermixed with *J. multifida*, by the side of a ditch, near the private road from Cadnam to Poultons, in the New Forest. *Mr. Lyell.*—Since found by the same gentleman, in August, 1813, in the moss of Kinnordy, Kerriemuir, Scotland.—It produces fructification, both male and female, in the winter and spring months.

PLANT growing in small and scattered patches, generally of a dull green color.

Roots: from a descending main branch (if I may so express myself), which appears to be altogether a continuation of the stem, and nearly equals it in thickness, arise several large subcarnose fibres, which shoot out in a horizontal direction: they vary much in length, generally exceeding a quarter of an inch, and are either simple or branched: their color is a dirty white, and the cellular structure is the same as that exhibited by the stem.

Stems varying from one line to half an inch, rarely more, in length, erect, slightly flexuose, filiform, but not remarkably slender, for the most part simple, though a divided stem is now and then observable, and a young shoot or innovation occasionally arises from various parts of the plant. The color is greenish; the texture closely cellulose.

The leaves in the taller individuals are rather distantly placed, more crowded in the shorter ones: all of them are patent or erecto-patent, sometimes a little recurved. They are inserted without order on every side of the stem, and vary in regard to size in all parts of it, and equally so in figure: a few are rounded in their shape, but the greater number are either ovate or oblongo-ovate, or, occasionally, ligulate, plane, cut at the margin, though not deeply, yet in a manner so irregular, that they they will be more easily understood by a reference to the annexed plate, than by any description I am able to give. I may observe, however, that, near the extremity of a leaf, two opposite lateral notches

(*J. Hookeri.*)

BRITISH JUNGERMANNIÆ.

are frequently seen, which thus form a large terminal lobe: and that, in other leaves, are formed smaller lobes or projections, as well acute as obtuse, which give to the margins a very jagged appearance. The substance is rather thin, and delicate, yet of such a nature as to dry very badly, shrinking considerably, and requiring a great length of time to recover after immersion in water: the *cellules* are moderately large, ovate; the *color* green, varying from a pale to a deeper hue.

The *perigonial leaves* are generally larger than the rest, and equally variable in figure with them, always situated at the extremity of the stem, by no means closely imbricated, nor have they the base (as is usual in the genus), particularly ventricose, nor the apex incurved, but rather expanded, so that the *Anthers* are always exposed.

Perichæatial leaves six or seven in number, and, as far as I have yet had the opportunity of observing, while enclosing the *Germen*, closely placed and imbricated, so as to form a cone (f. 9); in this state, too, their figure is very nearly oblongo-ovate, without any marginal incision or projection, concave. In a more advanced state of the fructification, they are not to be distinguished, except by their situation, from the cauline leaves, which they moreover exactly resemble in color and texture.

MALE FRUCTIFICATION in the axillæ of the perigonial leaves, where the

Anthers are placed in clusters of five or six together: each is nearly spherical, faintly reticulated, of a yellowish color, inclining to orange, when arrived at its full size. The *footstalk* is short and cellulose.

FEMALE FRUCTIFICATION terminal upon the stems or branches.

Calyx none!

Germen (f. 9) obovate, green, tipped with a tubular style, and surrounded at the base by a few abortive *pistilla*, which are linear, or only slightly swollen at the base, and at the apex, under a high magnifying power, are seen to have an expanded and hollow mouth.

Calyptra quite exposed, so as to resemble, at first sight, a calyx; as the main branch of the root below, so does this at the upper extremity, appear to be a continuation of the stem (f. f. 7. 8). It is of an oblong or lineari-oblong figure; at the extremity, however, it is generally a little incrassated; its base is of the same diameter as the stem, with which it likewise accords in its thick texture, as well as in *color*, only that it is somewhat paler. The *style*, or the rudiment of it, is at all times apparent, and just within the perichæatial leaves, even during the state of the ripe capsule, a few of the *pistilla* may be seen. At the apex, the calyptra opens with a vertical, but irregular fissure, for the emission of the capsule.

Peduncle about half an inch in length, white, filiform, succulent, terminated by the

Capsule; this is of a lineari-oblong figure, pale brown color, and reticulated structure, rather delicate, subpellucid. It opens, for the most part, into four equal linear valves, which often cohere at the extremity, in consequence, as it appears to me, of the entanglement of the filaments. Sometimes five valves are seen, and more than once Mr. Lyell has observed an appearance of only two valves, and these were held together at their apices, so as to form the exact figure of the periphery of an ellipse.

Seeds (f. 12) disposed within the capsule in threes, and enveloped in a transparent pellicle, through which they are distinctly seen, in an immature state, to be of a green color; when more advanced (f. 13) they become brown, and the pellucid covering is not apparent, though they very generally hang together (if I may so express myself) in threes.

BRITISH JUNGERMANNIÆ.

(*J. Hookeri*.)

Like the seeds, the *spiral filaments* are in a young state green, and enclosed in a thin white membrane (f. 12), which in their perfect state is lost. They are formed of a single *helix*, attenuated at each extremity, and, as in most of the frondose species, are attached to the extremity of the valves in pencil-shaped tufts.

Perhaps, there is not to be found, in the whole genus of *Jungermannia*, a species more decidedly marked, both in its fructification and its foliage, than that represented on the annexed plate. It is one of the many interesting discoveries made by Mr. Lyell, who kindly proposed that it should bear the name under which it has been already described in *English Botany*.

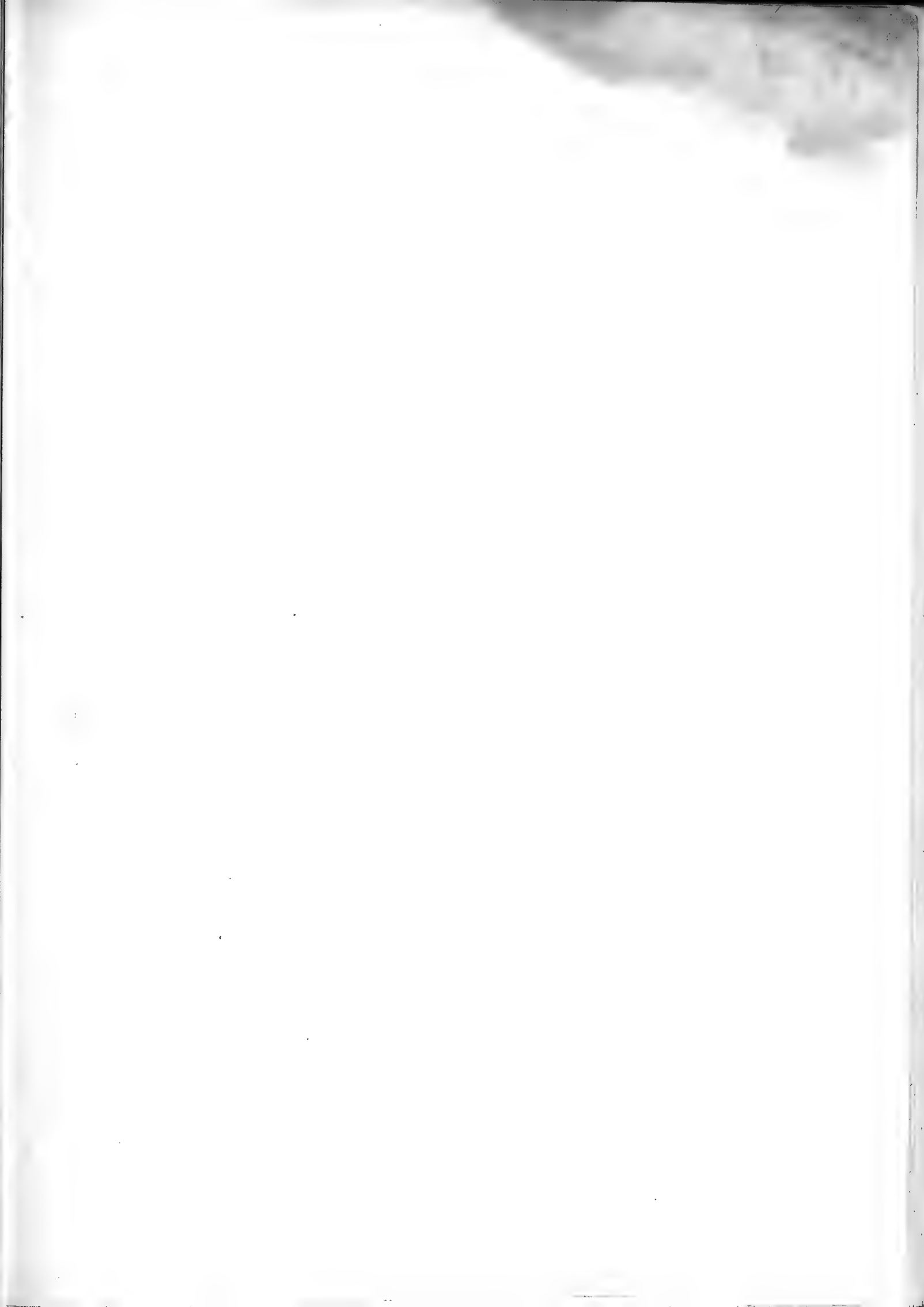
The most remarkable feature in this plant, (if I may be allowed such an expression, where every thing is so strange,) is the absence of a calyx, and the prominent fleshy calyptra, which, by a casual observer, might be taken for a calyx. The horizontal, thick, and fleshy fibres of the root, seem rather to belong to some phænogamous plant, than to the genus *Jungermannia*, almost all the species of which are furnished with remarkably slender, simple, and descending radicles. The multifarious insertion of the leaves is of rare occurrence in the present tribe of plants. Indeed, I am only acquainted with two species of British origin which have this peculiarity in common with it, *J. setacea* and *trichophylla*; but in every other respect, these plants are widely different; the individuals now mentioned having setaceous leaves, while those of *J. Hookeri* are broad and subovate, or ligulate, varying most remarkably in size, and in the shape and situation of the lobes and crenatures, with which the margin is generally furnished. Most of the *Jungermannia* are well known to possess the property of being easily restored to a fresh and vigorous appearance, after being dried for a considerable length of time: but the present species is a striking exception even to this rule, since, after ever so long an immersion in water, it very imperfectly recovers its original state.

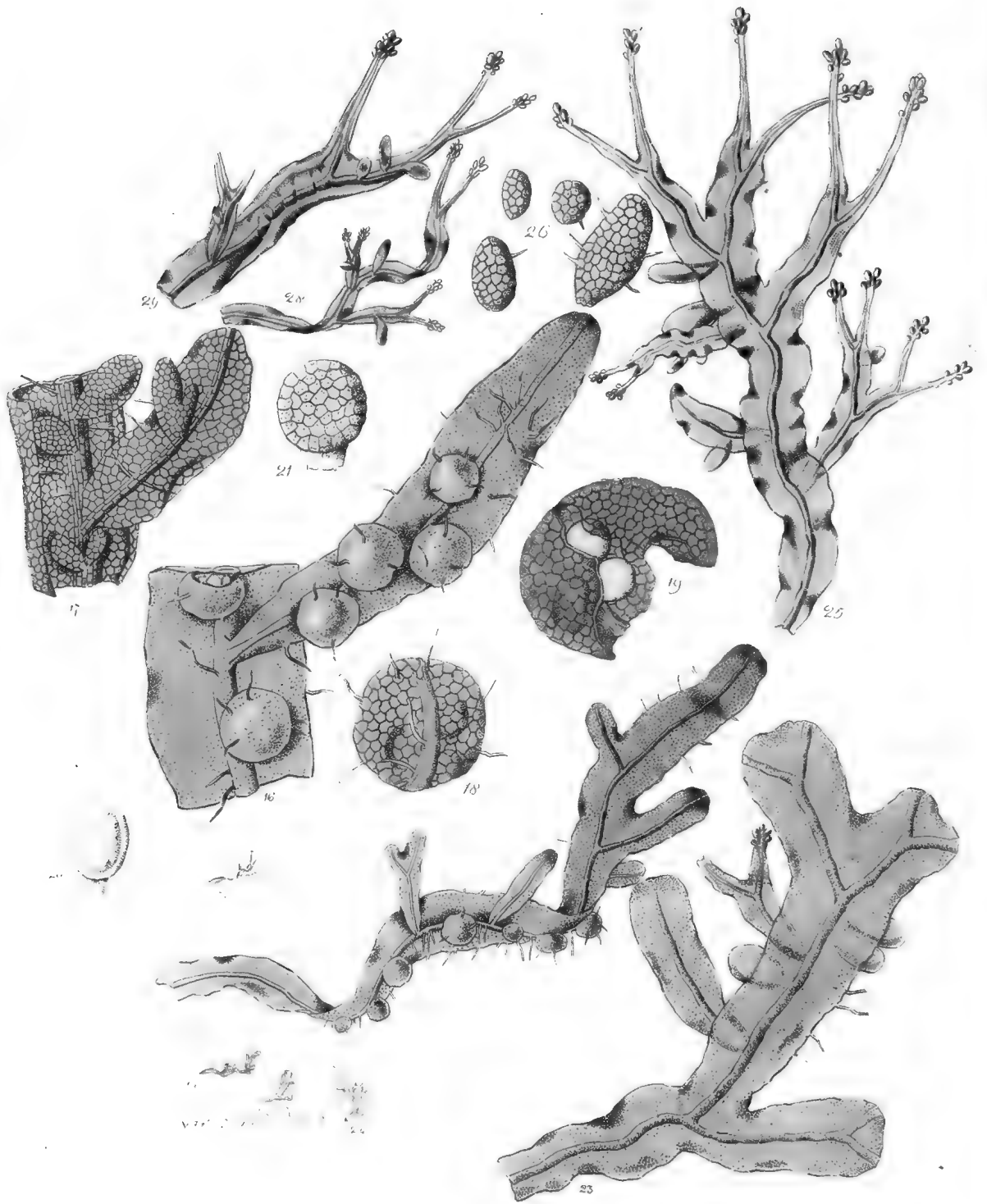
In the color of the Anthers, and in their exposed situation, a similarity may be traced between them and the Anthers of *J. pusilla*. But the female fructification is totally different, and, in the form of the capsule and the situation of the spiral filaments, there is a close analogy with *J. pinguis* and *multifida*, between which, and the *Jungermannia foliosæ*, *J. Hookeri* may be considered as holding the middle rank. The cohering of the apices of the valves of the capsule, which Mr. Lyell has remarked to be an equally common occurrence in the specimens he finds at Kinnordy, as in those from the New Forest, is not confined to this species: it also happens with the capsule of *J. Lyellii*. But in no other individual have I yet observed the seeds to be disposed in threes, within a pellucid covering; though, it is not impossible that such a circumstance may have escaped my notice, through neglect of examining the capsules in an immature state, when this appearance is most evident.

REFERENCES TO THE PLATE.

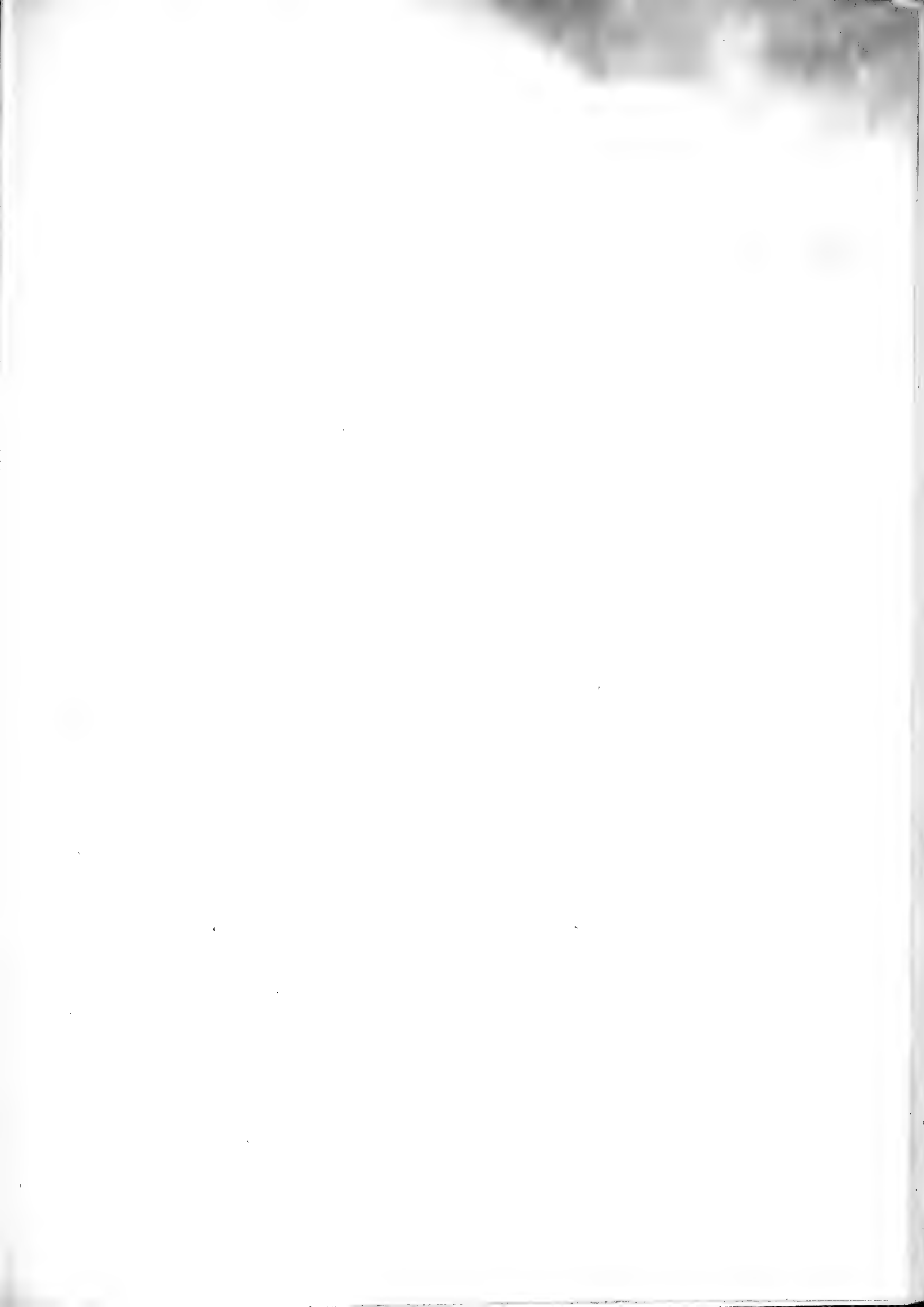
FIG.

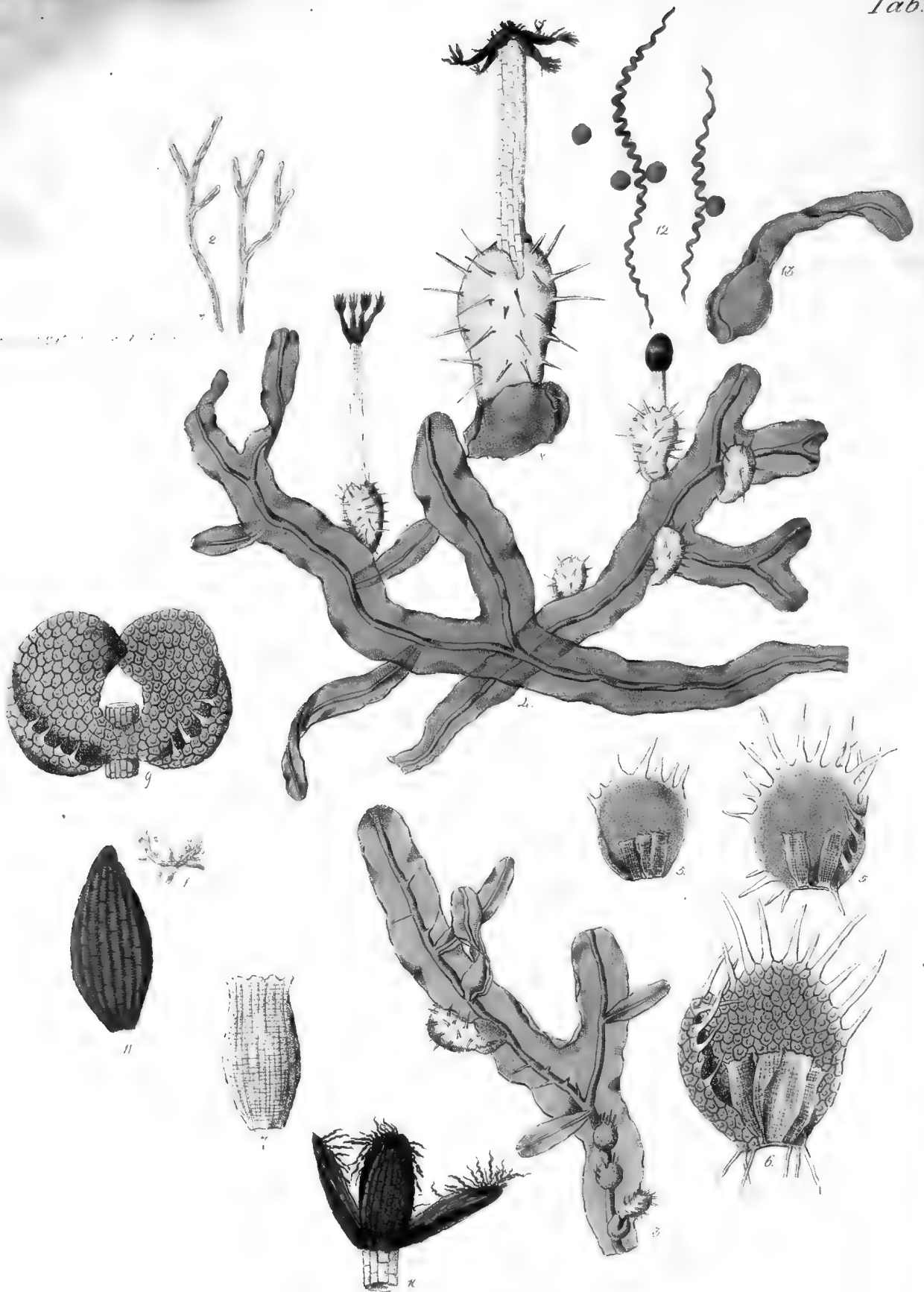
1. <i>J. Hookeri</i> , male plant, natural size.	
2. Female plant, natural size.	
3. Male plant, magnified.....	6
4. Apex of a male plant, with the <i>Anthers</i>	4
5. Perigonial leaf.....	2
6. <i>Anthers</i>	1
7. Female plant, calyptra still entire.....	6
8. Female plant, with capsules.....	6
9. Extremity of a young female plant, with the germen and abortive pistilla....	4
10. Exterior view of a perichatial leaf.....	2
11. Interior view of the same.....	2
12. Immature seeds and spiral filaments.....	1
13. Perfect seeds.....	1
14. Spiral filaments.....	1





Sargassum furcata.
Melosira cortugata. Lindl.





Jungermannia furcata.
Reiz. 1095. Lind.

JUNGERMANNIA FURCATA.

(TAB. LV. LVI.)

JUNGERMANNIA, fronde lineari, dichotomâ, membranaceâ, costatâ, suprâ lævi, subtùs, margineque plùs minùsve pilosâ: fructu ex inferiore parte costæ egrediente; calycibus bilobis, conduplicatis, margine ciliato; calyptrâ obovatâ, hispida.

- Jungermannia furcata*. LINN. *Sp. Pl.* II. p. 1602. *Syst. Nat.* II. p. 707. POLLICH, *Pal.* III. p. 201. *Fl. Salisb.* p. 231. SCHRANK, *Bavar.* II. p. 500. WEBER, *Spic. Fl. Goet.* p. 159. WEIS, *Plant. Crypt.* p. 108. WILLD. *Ber.* p. 344. SCOP. *Carn.* II. p. 352. VILLARS, *Delph.* IV. p. 926. SCHREBER, *Spic. Fl. Lips.* p. 109. *Enum. Pl. Fl. Dan.* p. 43. HOFFM. *Germ.* II. p. 90. ROTH, *Germ.* III. p. 413. HEDW. *Th. t.* 19. f. 99. 100. et t. 20. LINN. *Syst. Nat. ed. Gmel.* II. p. 1353. LAMARCK, *Encycl. Method.* III. p. 287. LAMARCK, *Fl. Fr. ed. 2. t. II.* p. 427. LAMARCK, *Fl. Gall.* p. 91. RELHAN, *Cant.* p. 441. HUDS. *Angl.* p. 518. LIGHTF. *Scot.* II. p. 791. WITH. III. p. 850. *Engl. Bot.* t. 1632. *Lichenastrum saxatile erectum, tenuifolium, furcatum.* Cat. Giss. p. 213. (fide DILL.) *Muscus squamosus, foliis subrotundis, densissimis, erectus, furcatus.* BUXB. *En. Pl. Hal.* p. 225 (fide DILL.) *Uloa saxatilis furcata, latiusculis et tenuioribus segmentis.* RAII *Syn. Stirp. Brit.* III. p. 63. *Hepatica arborea globuligera.* VAILL. *Bot. Par.* p. 98. t. 23. f. 11. *Marsilea minima angustifolia, floribus nigricantibus, ex inferiori foliorum parte e subhirsuta et turbinata vagina erumpentibus.* MICHELI, *Nov. Gen.* p. 5. t. 4. f. 4. *Lichenastrum tenuifolium furcatum, thecis globosis pilosis.* DILL. *Musc. t.* 74. f. 45. *Jungermannia foliis linearibus dichotomis, infernè florifera.* HALL. *Helv.* III. p. 64.

β. ELONGATA; frondibus majoribus, elongatioribus strictioribusque.

J. furcata β. maxima. WEBER, *Spic. Fl. Goet.* p. 160.

γ. ÆRUGINOSA, frondibus latioribus, apicibus (in gemmiferis plantis exceptis) dilatatis, obtusissimis.

Riccia fruticulosa. DICKS. *Plant. Crypt. Fasc. 1.* p. 8. (excl. syn. *Fl. Danicæ*). WITH. III. p. 870. HULL. p. 283.

Jungermannia fruticulosa. *Engl. Bot. t.* 2514.

HAB. Abundant in every part of the kingdom, growing as well upon the trunks of trees, and low bushes, as upon stones, rocks, and even on heathy ground. (Producing fructification, according to Dr. Taylor, from October till March.)—β. is not uncommon upon rocks, and

(*J. furcata.*)

BRITISH JUNGERMANNIÆ.

on the ground, in subalpine countries.— γ . has been found in various parts of Ireland by *Miss Hutchins*, *Mr. Templeton*, *Mr. Turner*, and *Mr. Mackay*.—At Kinnordy, Scotland, by *Mr. Lyell*, and near Forfar by *Mr. George Don*; but no fructification has hitherto been discovered upon this variety.

PLANT growing in large dense patches, closely appressed to the surface, which affords it nourishment.

The *Roots* consist of simple, white fibres, produced here and there from the lower surface of the midrib of the frond, and not easily distinguished from the hairs which are intermixed with them.

Fronds from half to three-quarters of an inch or rather more in length, creeping, horizontal, lying over each other in an imbricated manner: in width scarcely equalling half a line: throughout linear thin and submembranaceous, slightly waved, the margins quite entire, never (except in a very young state) simple, always branched in a somewhat dichotomous manner, with the ramuli furcate for the most part at the extremity; whence the name: the apices obtuse: the upper surface is destitute of hairs or covering of any kind; but the margin and the surface beneath are beset more or less thickly with rather stout, white, and simple hairs, which upon the margin have very frequently a ciliated appearance. The texture is delicate, the *cellules* roundish; the color a pale and pleasant green. Throughout the whole length of the frond and its ramifications a central, slender, but very distinct, nerve or midrib extends, on the lower surface alone of which are seen a few hairs: there too it gives rise to innovations, which are to be observed at almost every season of the year, and in various stages of growth, from the young, ovate, and almost nerveless shoot (t. LV. f. 17), to the larger, anther-bearing, and branched kinds, which in every respect resemble the parent, separating from it in a little time, throwing out roots, and becoming a new and distinct individual.

MALE FRUCTIFICATION abundant on distinct individuals from the female (see TAB. LV.), placed within a peculiar receptacle or *perigonium*, attached to the underside of the frond (f. 15, 16), and always upon the midrib. It has the appearance of being a young shoot or innovation (for in color and texture I can perceive no difference) rolled up into a spherical figure, and generally beset externally with bristle-shaped hairs (f. 18). It is sufficiently pellucid to admit of the

Anthers being obscurely seen within, and on cutting or tearing open a perigonium (f. 19), they may be distinctly seen to be fixed, in clusters of three or four in each, to the midrib. They are of an ovate or spherical form (f. 20, 21), faintly reticulated in an early stage of growth, more remarkably so when arrived at their full size. The *footstalk* is very short, white, obscurely striated.

FEMALE FRUCTIFICATION (TAB. LVI.) arising from various parts of the lower surface of the midrib.

The *Calyx* at first resembles a scale (f. 3. 5), appressed to the frond, of a roundish form, convex on the external surface, at the extremity, and, indeed, not unfrequently along the whole margin, very beautifully fringed with long whitish cilia or hairs: at a more advanced period (f. 6) it may be seen to be two-lobed, and when the *calyptra* is exerted the *calyx* is cut into two very deep, subreniform lobes, which are conduplicate, embracing the base of the *calyptra* (f. f. 3. 8. and 9). These, I have great reason to believe, shoot out into innovations, after the decay of the fructification; for their two-lobed figure gradually disappears, and the calyces are converted into shoots, like that represented at f. 13. of TAB. LVI.

BRITISH JUNGERMANNIÆ.

(*J. furcata*.)

Pistilla (f. f. 5, 6, 7) rarely more than three or four in each calyx, large, broadly ovate, the mouth a little expanded and crenate. They are faintly marked longitudinally and transversely with dusky lines.

Calyptra obovate, carnose, curved at the base, which, as has been already remarked, originates in the underside of the frond, erect, at the extremity of a whitish color, beset on every side with many white, rigid hairs or bristles, which stand out for the most part in a horizontal direction, and give the calyptra a remarkably hispid or almost echinated appearance. An irregularly torn but vertical fissure is formed for the emission of the capsule.—I have not been able to discover any *style*.

Peduncle about thrice as long as the calyptra, rather wide in proportion to its length, white, cellulose, tipped with the ovate, or rotundo-ovate,

Capsule, which is of a deep brown color (f. 16), strongly reticulated, opening into four equal ovate valves, that soon fall back and become twisted.

Seeds spherical (f. 12), brown or fulvous: the *spiral filaments* are of the same color, composed each of a single *helix* of considerable length, and much attenuated at each extremity. Many of them continue to adhere at the apices of the valves of the capsule, as in *J. Hookeri*, *J. pinguis*, &c.

Var. β. (f. 2) scarcely differs from α but in its larger size, and more elongated, as well as straiter, habit. It is also of a more yellow color than the usual appearance of the plant.

Var. γ. (t. LV. f. f. 22, 23) is most remarkable for its color, which is of a fine verdigris green, especially towards the apices of the frond, which are moreover considerably dilated, and the whole plant is of a more delicate texture than is the case in α . A further difference may be observed in the midrib, which in γ is frequently forked within the frond, and immediately below the apex. I am aware that this peculiarity is occasionally seen in α , but it is so much more common in the æruginose variety, as justly to entitle it to observation. With regard to the color of γ I ought to remark that it is sometimes, but not always, visible in a fresh state, Mr. Turner and Mr. Mackay having been directed to the habitat by this circumstance: whereas Mr. Lyell and Mr. Templeton both observe that it becomes æruginose after having been kept for a length of time in a dried state. In all other respects this *var.* resembles α , and like it produces abundant innovations. By these it increases, but not by these alone, for copious terminal clusters of *gemmæ* have been found upon this variety, first by Mr. Lyell, and afterwards by Mr. Don and Miss Hutchins. In a gemmiferous state the present individual has a new and very striking character; for the forked ramuli (f. f. 25, 29) have their margins so much recurved as to make them appear almost cylindrical, and at their apices the *gemmæ* are formed, and adhere, though slightly, in clusters. These *gemmæ* (f. 26) vary much in size, and not a little in form; but they all agree in being of the same cellular structure as the plant, and in this respect resembling the *gemmæ* of *J. minutissima*. At first they are roundish or ovate, afterwards more oblong, and when they fall from the frond they may be seen to have marginal hairs. Although I have not had the opportunity of tracing them in a more progressive state, I think there cannot be a doubt that they are destined every one to form perfect plants. Their color is of the same æruginose green as the frond.

(*J. furcata*.)

BRITISH JUNGERMANNIÆ.

Jungermannia furcata is one of the most common species of the genus, and, as such, is familiar to every student of Cryptogamic Botany. The conformation of its various parts, however, is deserving of the most minute investigation, for I have scarcely met with any species which offers at the same time so much beauty and singularity of structure united. Hitherto the curious calyx, the perigonium, and the gemmæ, have escaped the notice of writers upon the subject, or have been but very imperfectly and incorrectly described. Even the illustrious Hedwig has been far from happy in his account of the antheriferous receptacle, the calyptra, and the seeds, all of which differ considerably from what I have myself had the opportunity of examining. In another part of this Monograph I shall have occasion to speak more fully on this subject. Roth is surely incorrect, when he says "Calyx ex aversa frondium pagina propullulans, adscendens, conicus, ovatus, hirsutus, viridis. Corolla calyce brevior, tenuissima;" and further, "ab omnibus hujus phalangis in eo recedit hæc planta, ut calyx ex adversa frondium pagina adscendat tubulosus, ovatus, corollam minorem includens cum in reliquis calyciformis e frondis substantia per integumentum commune dilaceratum protrudatur." The corolla is surely the part that is protruded, and in this particular accords with all the rest of the *Jungermannia frondosæ*. In its delicate texture, and in the strongly marked though slender midrib, *J. furcata* resembles *J. Lyellii*, from which, and from every other species in the genus, it is nevertheless abundantly distinct.

There is no reason whatever for considering the var. γ . a *Riccia*. The *Riccia fruticulosa* of *Flora Danica*, I fully agree with Dr. Smith in thinking quite a different plant, and probably (if I may be allowed to judge from the figure) the *Jungermannia palmata* of Hoffmann.

BRITISH JUNGERMANNIÆ.

(*J. furcata.*)

REFERENCES TO THE PLATES. (TAB. LV. AND LVI.)

(TAB. LV.)

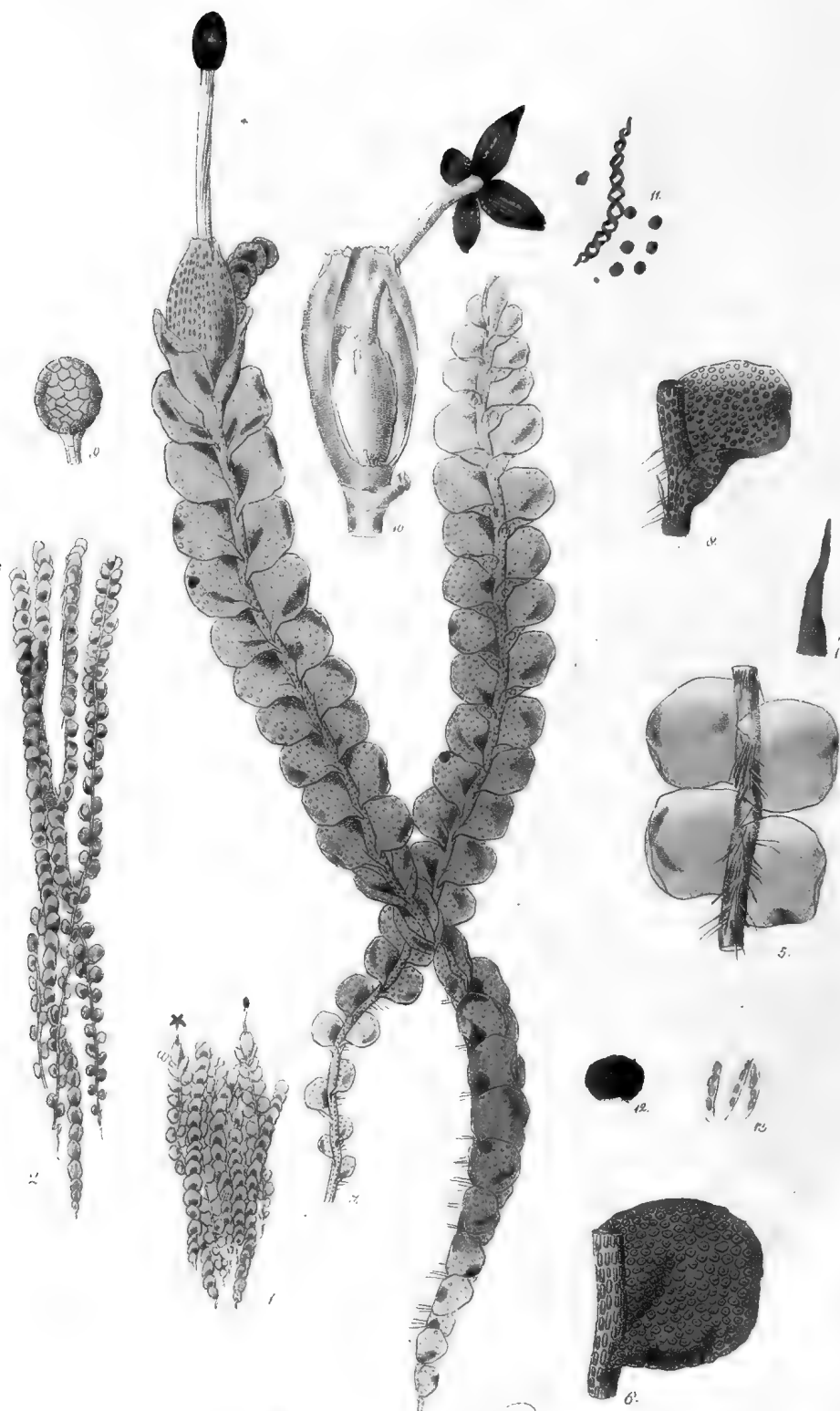
FIG.

14. <i>J. furcata</i> , with male fructification, natural size.	
15. The same, magnified.....	6
16. A portion of the stem and innovation, with male fructification.....	4
17. Portion of a gemmiferous plant, seen from the under side.....	4
18. Perigonium, with the Anthers included	3
19. Perigonium torn open	3
20. Anther in a young state	1
21. Anther fully formed.....	1
22. Var. γ , natural size.	
23. The same, magnified.....	6
24. Gemmiferous plant, natural size.	
25. The same, magnified.....	6
26. Gemmæ.....	1
27. Gemmiferous plants, shewing the under surface, natural size.	
28 and 29. The same, magnified.....	6

(TAB. LVI.)

FIG.

1. <i>Jungermannia furcata</i> , female plant, natural size.	
2. Var. β , natural size.	
3. Under side of a female plant, with the fructification in various stages of forwardness, magnified.....	6
4. Fertile plants, upper side.....	6
5. Calyces in a young state, and pistilla.....	4
6. A calyx more advanced.....	3
7. Pistillum	1
8. Calyx, corolla, and capsule.....	3
9. Calyx expanded	2
10. Capsule opened.....	2
11. Valve of the capsule.....	1
12. Seeds and spiral filaments	1
13. Calyx lengthening into a shoot.....	3



Jungermannia Taylori
Leptoseyous Taylori Hook. & Mill

JUNGERMANNIA TAYLORI.

(TAB. LVII.)

JUNGERMANNIA, caule erecto, subsimplice; foliis bifariis, rotundatis, (siccitate punctatis,) patentibus, secundisve: stipulis latè subulatis: fructu terminali; calycibus ovatis, apice compressis, truncatis, bilabiatis.

HAB. Toulagee, a lofty mountain in the county of Wicklow, Ireland. *Dr. Taylor*.—Found also in the vicinity of Bantry, by *Miss Hutchins*.—Two miles from Ambleside, to the north of the Penrith road; and on the rock, behind the hill, at Patterdale, near Ullswater, Cumberland, in great plenty, and in the highest beauty, together with *J. radicans* and *J. barbata*. *Mr. Lyell*.—Upon Cairn-gorum, and other mountains of the Highlands of Scotland.—*Mr. Don* finds it upon the Clova mountains.

PLANT growing in rather large patches, as dense as those of *Sphagnum latifolium*.

Roots issuing in small tufts of simple, whitish fibres, from near the base of the stipules.

Stems erect, from two or three, to four and even five inches in length, filiform, flexuose, simple, or now and then producing one or two small innovations, which are more generally found about the extremity of the stem, and especially in the fructified specimens, than in any other part of the plant, or in its barren state. The *substance* is rather firm, at the base even rigid, when dry, and brownish; towards the apex more succulent, having the cellules distinctly visible with a lens, and of a green or purplish tinge.

Leaves about three quarters of a line in length, at least near the middle of the sterile individuals; for, as they recede from that part, they gradually become smaller (f. 3). In the female plants, on the contrary, the largest leaves are those which approach the calyx (f. 4). They are every where rather closely and bifariously placed, slightly imbricating each other, alternate, horizontally patent with regard to the stem, or, not unfrequently, erect and secund, as is represented at the base of fig. 4: their form is round or suborbicular, plane or very slightly concave, at the margins entire, sometimes a little waved, and at the extremity a small portion is generally recurved, as is more distinctly seen on the underside of the leaves (f. 5): their base is decurrent and obliquely semi-

(*J. Taylari.*)

BRITISH JUNGERMANNIÆ.

amplexicaul. The *substance* is, in a striking degree, thick and subcarnose, the *cellules* large, of a roundish figure, but by no means regularly or closely placed (f. 6); when dry, from the circumstance of the shrinking of the *cellules*, a curiously punctated appearance is observable even with the naked eye. The *color* is of a dingy but yellowish-green at the base of the plant, gradually assuming a purple tint as the leaves approach the extremity of the plant, where they are entirely of that color.

Stipules (f. f. 7. 8) though minute, always present, widely subulate, and, like the leaf, composed of *cellules* of a roundish form, and large in proportion to the size of the stipule. Their *color* is usually pale green.

Perigonal leaves more concave, and for the most part more crowded than the rest; at the base they are a little swollen, and the margin is there incurved (f. 8).

Of the *Perichætical leaves* there is one erect pair to the base of each calyx, to which they are in a slight degree appressed; their margins are frequently a little waved.

MALE FRUCTIFICATION (f. 3) generally near the centre, but sometimes at the extremity of the stem: two or three spherical pedunculated

Anthers (f. 9) are situated in the axilla of each perigonal leaf.

FEMALE FRUCTIFICATION terminal.

Calyx (f. 10) ovate, or oblongo-ovate, by no means plicate, cylindrical, except at the apex, where it is compressed, truncate, very obsoletely toothed, and divided into two short lips.

In *color* and *texture* it closely resembles the leaves, but the *cellules* are of a more oblong shape.

Calyptra obovate (f. 10), whitish, somewhat membranaceous, reticulate, tipped with a short tubular *style*. A few small *barren pistilla* surround its base.

Peduncle short, being scarcely three times the length of the calyx, white, cellulose.

Capsule ovate, dark brown, furrowed longitudinally and transversely, splitting into four equal valves (f. 10).

Seeds spherical, fulvous. *Spiral filaments* composed of a double *helix*, short, rather closely twisted (f. 11).

OBS. Upon the leaves of this species, a very minute, nearly spherical, blackish, tuberculated *Fungus* is frequently to be seen, and I have figured it in the annexed plate (see f. f. 3, 4, 12, 13). Internally, along with a whitish mucilage, it contains a number of oblong pellucid bodies, each with from two to four ovate brownish seeds. A very similar parasite, if not the same, is found also on the leaves of *J. scalaris*, but I am not aware that they have ever come under the notice of any writer upon the subject.

I have already mentioned, under my description of *J. anomala*, the distinguishing marks between that species and the present, and I have little more to add, but that my own subsequent observations, as well as those of Mr. Lyell, who has lately had the best opportunity of examining the two plants in their native places of growth, have more and more strengthened the opinion that

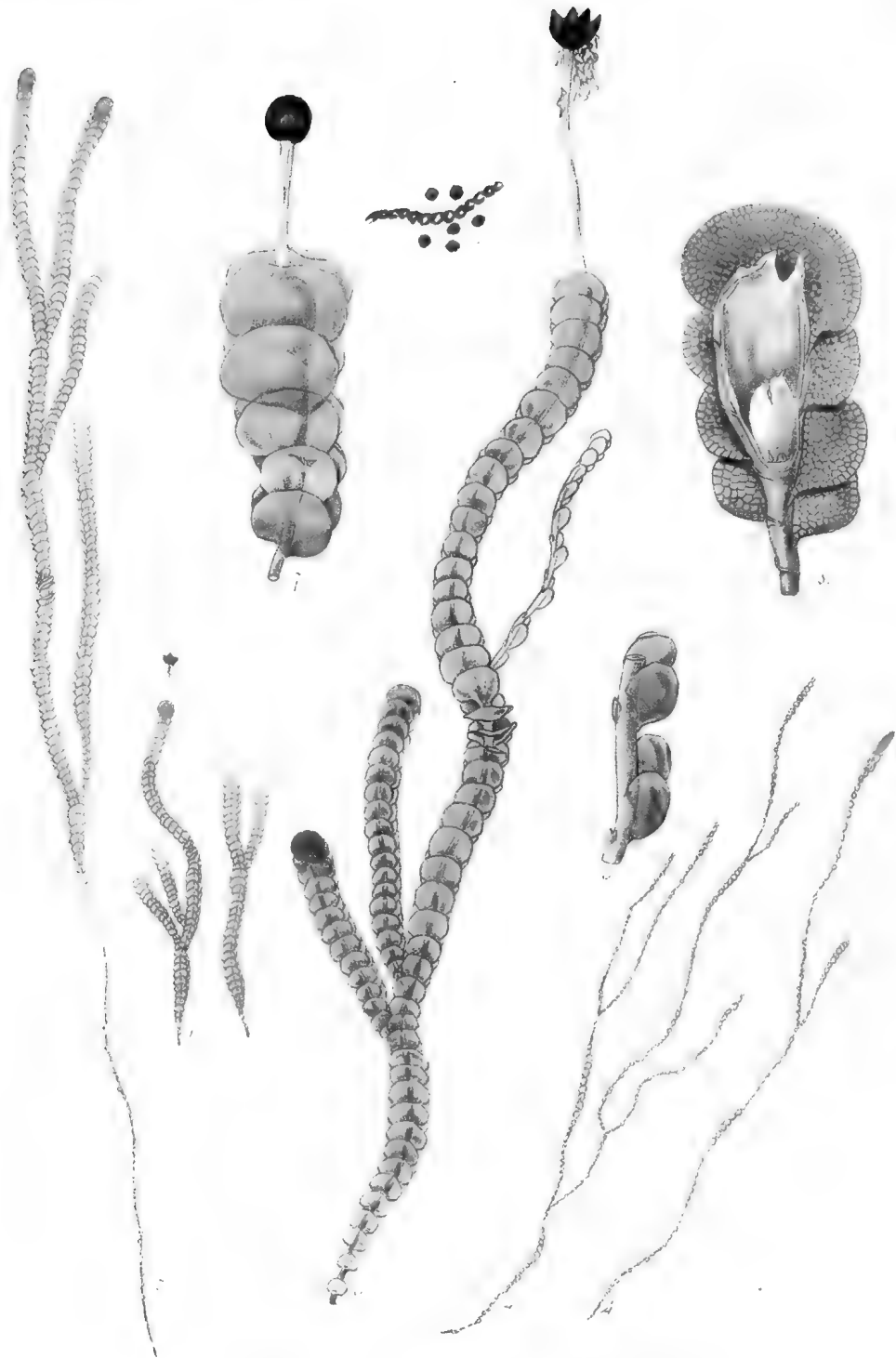
they are truly different. Notwithstanding the unwearied exertions of the able Botanist just mentioned, the fructification of *J. anomala* has hitherto eluded his research; but, whatever be the fate of that plant, the one here described, and named after my friend Dr. Taylor, of Dublin, will, I trust, be permitted to hold its place in the list of species, as a memorial of the great assistance which I have derived from one of the most zealous and acute Cryptogamists of the present day.

Mr. Lyell observes that *J. Taylora* has an agreeable odor, which resembles that arising from the flowers of the Heath.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. Taylora</i> , male and female plants, natural size.	
2. Sterile plants, natural size.	
3. Male plant, magnified	6
4. Female individual	6
5. Portion of the stem seen from beneath	5
6. Leaf	4
7. Stipule	3
8. Perigonal leaf	4
9. Anther	1
10. Calyx, Calyptra, and Capsule	5
11. Seeds and spiral filaments	1
12. Parasitic Fungus detached from the leaf	2
13. Seeds of the same, enclosed in a pellucid covering	1



Jungermannia compressa.
Polypodium compressa Dum.
Allicularia compressa (Hees) Nees.

JUNGERMANNIA COMPRESSA.

(TAB. LVIII.)

JUNGERMANNIA, caule erecto, diviso: foliis bifariis, orbicularibus, (summis subreniformibus,) planis, erectis, appressis: stipulis in innovationibus junioribus, minutissimis, bifidis integrisque; in caule nullis: fructu terminali; calycibus perichætiō immersis, oblongis, carnosis; ore aperto, quadridentato.

HAB. Mountain rivulets, near Bantry. *Miss Hutchins.*—Lough Bray. *Dr. Taylor.*—(It produces fruit in the month of June.)

PLANT growing in dense, purplish tufts, of some inches in diameter.

Roots, scarcely any; a few simple fibres may here and there be seen near the base of the plant. *Stems* varying from two to six inches, or more, in length, erect, or only growing in a horizontal direction, when carried down by the force of a mountain streamlet, filiform, flexuose, branched, or at least appearing so, in consequence of the innovations, which are rather copiously produced, and are often of such a size as scarcely to be distinguished from the stem itself: all of a brown or purplish *color*, and a cellular *texture*, though, in the older parts of the plant, the *cellules* are obscure, and almost obliterated.

Leaves often three-fourths of a line in length, varying in size in different parts of the plant; but in general largest at the extremity of the stem, both in the fertile, and in the sterile individuals: they are closely but alternately placed, imbricating each other in a very regular and beautiful manner, erect, appressed, and, from their pellucid nature, suffering the stem to be seen through them, dividing each of them, as it were, into two nearly equal halves (f. 5); in figure, they are for the most part orbiculate, except those at the extremity, which are nearly reniform, all plane, decurrent at the lower margin, and every where entire. In those individuals, which have been subject to the action of a current of water, the leaves are at intervals distantly placed, and often decayed (f. 4), and, on the young innovations, they are much less closely arranged, somewhat concave, and have not unfrequently an oblique direction (f. 6). The *texture* of the leaves is semi-pellucid, peculiarly thin and delicate, so as to be almost membranaceous, but, when dry, somewhat rigid; the *cellules* are roundish, those at the margin of a regularly subquadrate form. The *color* is in the lower leaves a pale yellowish green, while those above are of a fine deep purple.

(*J. compressa*.)

BRITISH JUNGERMANNIÆ.

Of the *stipules*, I have been able to discover none upon the principal stems; but, on the young innovations, both Dr. Taylor and myself have seen them of an ovate form, extremely minute, sometimes entire, sometimes notched or bifid (f. 6). Similar *stipules* have, since the publication of *J. Sphagni*, been discovered upon the gemmiferous shoots of that species likewise.

The *perichæatial leaves* are no otherwise different from the rest, than in being somewhat larger: three or four pair (f. 7) arise from the exterior surface of the calyx, in such a manner as wholly to cover it.

MALE FRUCTIFICATION at present unknown.

FEMALE FRUCTIFICATION terminal.

*Calyx** immersed in the perichæatial leaves, oblong or club-shaped, of a very thick and subcarinose texture every where, except at the margin, where it has a more foliaceous appearance, and is divided into four large acute and equal-sized teeth or segments (f. 8).

Calyptra ovate, thin, delicate, reticulated, tipped with a small style.

Peduncle four or five times the length of the calyx, white, striated transversely and longitudinally.

Capsule spherical, red-brown, splitting into four equal, ovate valves, and discharging the seeds and spiral filaments, of which the former are exactly spherical, and, as well as the latter, of a fulvous color.

Notwithstanding the peculiarity in the general habit of this interesting discovery of Miss Hutchins, arising from the curious disposition of the leaves and their general texture, it is difficult to fix upon a satisfactory specific character that will distinguish it from *J. Taylora*, without the aid of the fructification, the discovery of which we owe to the Botanist after whom the latter plant is called. The trivial name has been suggested by my excellent friend, Mr. Lyell, to whom I communicated specimens, and whose remarks upon the sterile individuals are so excellent, that my readers will thank me for transcribing them unaltered and unabridged from his letter. "A cursory view of a young innovation made me suspect that Miss Hutchins had got hold of my *J. hyalina*†, and the general figure of the plant recalled a specimen of *J. scalaris* sent me by Mr. Templeton. But *J. compressa* is less transparent than *J. hyalina*, and more so than *J. scalaris* usually is; the reticulation is smaller than in either; and the outer row of cellules smallest, which is very uncommon. —Moreover, it is of upright growth, and sends out no radicles from the stalk, differing in that respect from the two above-named *Jungermanniæ*, and from *J. Taylora*. The leaves are circular, imbricating and becoming gradually larger towards the apex of the stalk. They are bifarious, and the insertion is nearly at right angles to the stalk; so that, when viewed laterally, they project on

* In the present species, as well as in *J. scalaris* and *J. emarginata*, and possibly in all the *Jungermanniæ* which have an immersed calyx, this part has the appearance of being nothing more than the extremity of the stem incrassated, and hollowed out for the reception of the pistilla; for the texture of the calices always resembles that of the stem; and they are never deciduous, as is the case with the exserted calices.

† A new species that will shortly appear in this Monograph.

BRITISH JUNGERMANNIÆ.

(*J. compressa*.)

both sides of the stalk, (about two-thirds towards the front, and one-third towards the back). When moist, the leaves are plane, and the insides of the opposite ones touch each other, which gives the plant a singularly compressed appearance, and makes it refuse to lie in any position but its side, when examined on the table of the microscope.—In drying, the leaves become somewhat waved and deflected at the apex."

It is a curious circumstance, that the stipules should be confined (at least, as far as my own observations and those of Dr. Taylor have gone) to the younger innovations. Can it be that they exist upon the stems of the *young* plants, and upon the young ones only, in the same manner as the stipules of many phænogamous plants, and especially of the *Salices*, which are seen only during an early stage of the foliation?

The paucity of radicles is a farther peculiarity which this *Jungermannia* has in common with others, which, like it, grow almost wholly in the water, and which have their stems likewise densely crowded.

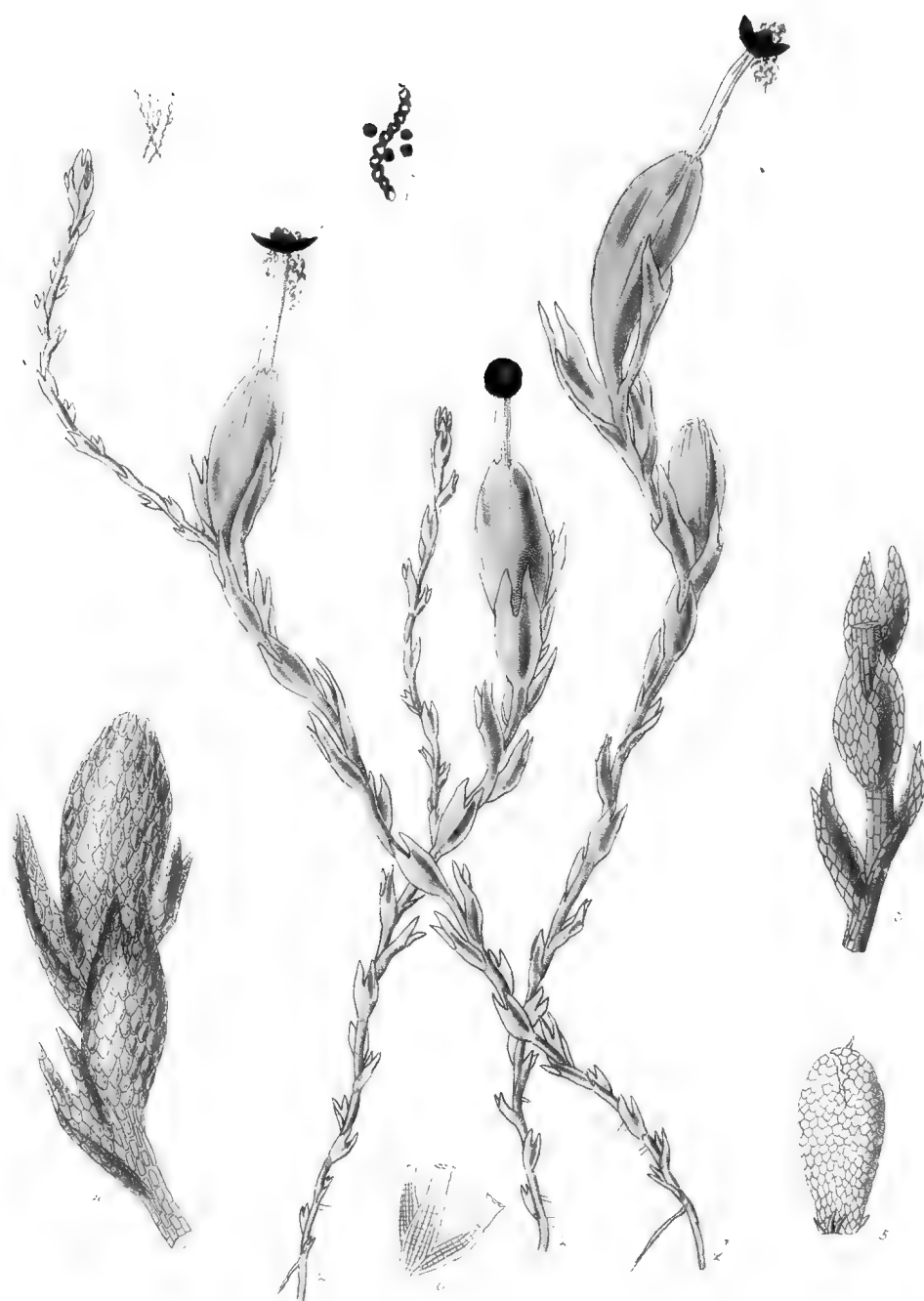
J. compressa ought, without doubt, to rank next *J. scalaris*, *J. Taylora*, and *J. anomala*, with the former of which it agrees in the immersed capsule.

REFERENCES TO THE PLATE.

FIG.

1. *J. compressa*, female plant, natural size.
- 2, 3. Sterile plants, natural size.
4. Sterile plants, which have been altered in their appearance by the strength of the current, natural size.
5. Female plant, magnified 6
6. Portion of a young innovation, shewing the stipules 5
7. Extremity of a fertile shoot 5
8. A calyx, longitudinally dissected, exhibiting the inside of one row of leaves, }
with the calyptra and pistilla. } 3
9. Seeds and spiral filaments. 1





Jungermannia laxifolia.
 (By the Rev. J. E. Smith, F.R.S., & J. E. Smith, Esq.)

JUNGERMANNIA LAXIFOLIA.

(TAB. LIX.)

JUNGERMANNIA, caule erecto, simpliciusculo, filiformi: foliis distantibus, quadrifariis, erecto-patentibus, ovatis, subcarinatis, acutè bifidis; (perichæatialibus similibus): fructu terminali; calycibus oblongis, subplicatis; ore contracto, dentato.

HAB. Mountain rivulet, near Bantry. *Miss Hutchins.*—In a stream upon Castle-Kelly mountain, county of Wicklow. *Dr. Taylor.*—(The capsules are perfected in April. Calyces are found during most of the summer months.)

PLANT growing in small, but very dense, green tufts or cushion-like patches.

Roots (as in *J. compressa*) scarcely any; the few that do exist are confined to the lower part of the stem.

Stems erect, filiform, flexuose, about half an inch long, extremely slender, simple, or beset with one or two innovations, uncertain as to their place and length, but always more slender than the main stem, and undivided. The *substance* is tender and flaccid, composed of large, conspicuous, oblong cellules; the *color* a pale green, approaching in some instances to olive.

Leaves (f. 3) distantly and alternately placed, arising from four sides, of large dimensions when compared with the diameter of the stem, becoming, however, gradually smaller as they recede from the apex: the smallest are seen upon the innovations; they are all patent or erecto-patent, ovate, generally slightly carinated, and cleft, for about one-third of their length, by an acute sinus, into two equal, rather sharp, but altogether entire segments. Their *texture* is peculiarly soft (if I may be allowed the expression) and flaccid; the *reticulation* very large, and formed by oblong *cellules* (f. 4).

Perichæatial leaves larger than the rest, and, what is remarkable, even more distantly placed than the cauline ones, not unfrequently leaving the whole calyx exposed (f. 2).

MALE FRUCTIFICATION unknown.

FEMALE FRUCTIFICATION terminal, or, if apparently lateral, only rendered so by the circumstance of an innovation being produced immediately beneath it.

(*J. laxifolia*.)

BRITISH JUNGERMANNIÆ.

Calyx (f. 4) large, oblongo-ovate or obovate, for it generally increases in size upward, very slightly plicate; the *mouth* contracted and toothed. It is of the same color and texture as the leaves.

Calyptra (f. 5) ovate, membranous, whitish, reticulated; *style* short. *Barren pistilla* small, situated at the base of the *calyptra*.

Peduncle scarcely more than twice the length of the *calyx*, white, cylindrical, succulent, cellulose.

Capsule exactly spherical, opening into four equal ovate valves, which are longitudinally and transversely furrowed.

Seeds (f. 7) spherical, and, together with the *spiral filaments*, of a fulvous brown; these latter formed of a double closely-twisted *helix*.

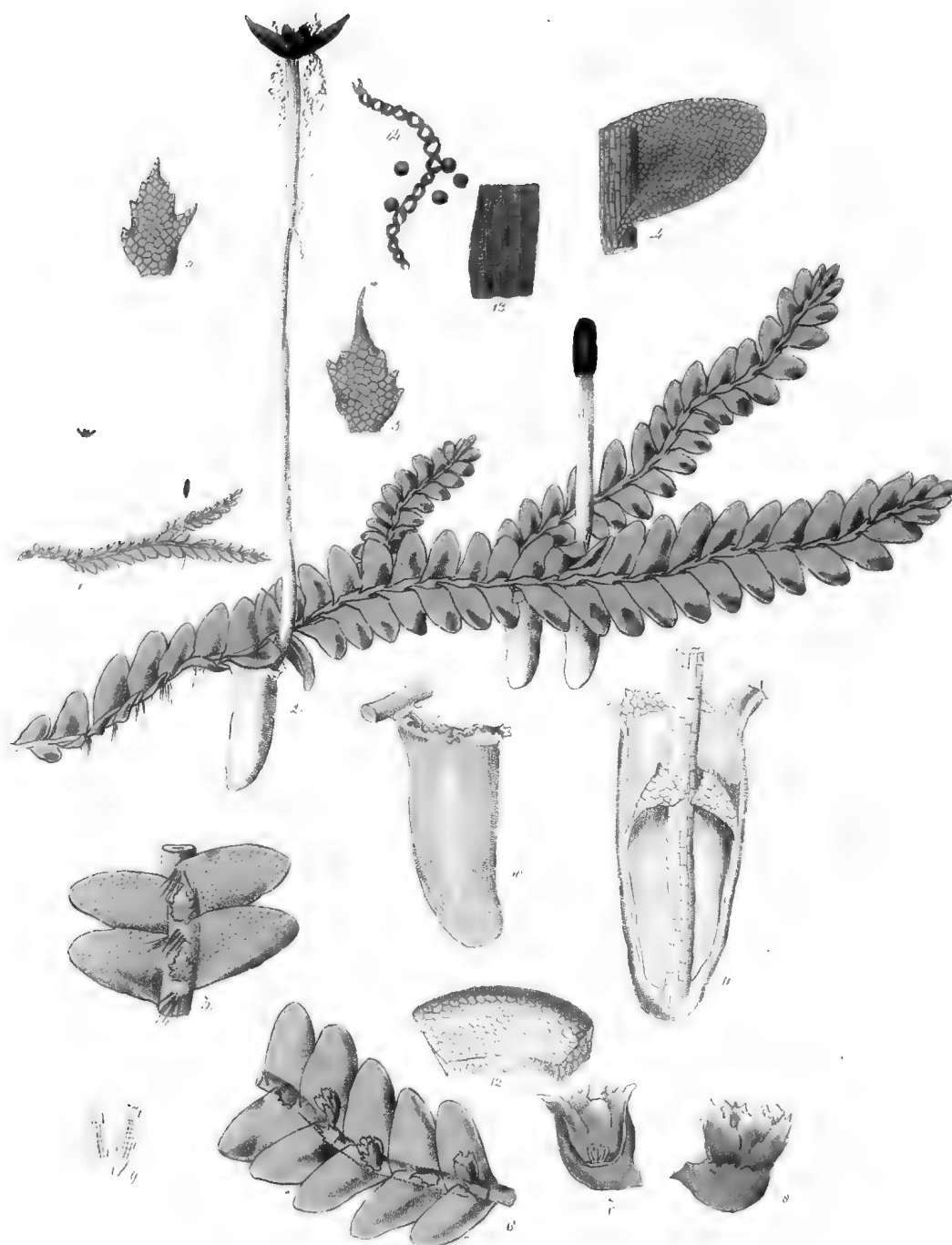
J. laxifolia belongs to that division of *Jungermanniæ*, which have their leaves placed in a quadrifarious manner, and of which so few species have hitherto been detected. With *J. julacea* it will be seen to have many points in common, but will be found to differ materially, not only in the greater size and larger cellules of the leaves, but also in the form and disposition of the perichæatial ones, in the texture of the foliage, and in the color: in these last particulars approaching *J. bicuspidata*, a species from which it otherwise is abundantly distinct.

Hitherto this elegant little species has been found only in Ireland; a country no less fertile in rare and singular plants, than fortunate in Botanists both able and willing to detect and investigate them.

REFERENCES TO THE PLATE.

FIG.

- | | |
|------------------------------------------|---|
| 1. <i>J. laxifolia</i> , natural size. | |
| 2. Fertile plants, magnified | 6 |
| 3. Portion of the stem, and leaves | 4 |
| 4. Calyx and perichæatial leaves | 3 |
| 5. Calyptra | 3 |
| 6. Barren pistilla | 1 |
| 7. Seeds and spiral filaments | 1 |
-



Jungermannia viticulosa.
Jungermannia viticulosa Sm.

JUNGERMANNIA VITICULOSA.

(TAB. LX.)

JUNGERMANNIA, surculo procumbente, ramoso: foliis bifariis, subimbricatis, horizontalibus, planis, ovatis, integris: stipulis latè ovatis, dentato-laciniatis: fructu laterali; calycibus subterraneis, oblongis, carnosus; ore squamis foliaceis fimbriato.

Jungermannia viticulosa. LINN. *Sp. Pl.* II. p. 1597. *Syst. Nat.* II. p. 705. NECK. *Meth. Musc.* p. 134. SCHRANK, *Bavar.* II. p. 494. LEERS, *Herb.* p. 249. ALLIONI, *Fl. Ped.* II. p. 311. WEIS, *Plant. Crypt.* p. 112. WEBER, *Spic. Fl. Goet.* p. 132. HOFFMANN, *Germ.* II. p. 88. ROTH, *Germ.* III. p. 371. OEDER, *Enum. Pl. Fl. Dan.* p. 41. HUDS. *Angl.* p. 509. LIGHTF. *Scot.* p. 772. RELHAN, *Cant.* p. 439. LINN. *Syst. Nat. ed. Gmel.* II. p. 1348. WITH. III. p. 855. LAMARCK, *Encycl.* III. p. 279. LAMARCK, *Fl. Fr. ed. 2.* t. II. p. 430. LAMARCK, *Fl. Gall.* p. 92. MICHAUX, *Fl. Bor. Am.* II. p. 311. *Engl. Bot.* t. 2513 (*bona*.)

Lichenastrum capitulis nudis, Trichomanis facie, foliolis densius congestis, majus. RAII *Syn.* p. 111.

Jungermannia terrestris, viticulis longis, foliis perexiguis, densissimis, ex rotunditate acuminatis. MICHELI, *Nov. Gen.* p. 8. t. 5. f. 4. (*figura bona*.)

Jungermannia, foliis pinnatis, subrotundis, ex caule florifera. HALL. *Helv.* III. p. 60.

HAB. In subalpine countries; far from uncommon; in various parts of England, Scotland, and Ireland, growing, as well upon the ground, as upon mosses and other *Jungermannia*.
(It bears fructification in the spring months.)

PLANT growing in loosely-matted patches of various sizes, rendered conspicuous by their yellowish brown color.

Root a few whitish, simple fibres, proceeding in small clusters, the whole length of the stem, from beneath the stipules.

Surculi varying in length from one to three inches, filiform, slightly flexuose, simple, or, as generally happens, divided by innovations of various lengths, that are patent, and resemble the parent stems in every thing excepting size. All are procumbent: their *texture* is firm, rather rigid when dry; the *cellules* very compact: the *color* a dirty reddish brown.

Leaves about half a line long, smaller towards the extremity and at the base, alternately, but rather closely and very regularly, arranged in a bifarious manner, horizontal, plane, or

(*J. viticulosa*.)

BRITISH JUNGERMANNIÆ.

slightly convex on the upper surface, of an exactly ovate figure, widest at the base, where they are a little decurrent; their margins always destitute of every kind of incision, and serrature. The *substance* is somewhat firm; the *cellules* minute and roundish; the *color* a yellow brown, or only green when growing in a very shaded situation.

Stipules (f. f. 3. 5) small, widely ovate, approaching to round; the margin more or less toothed and laciniated; the apex usually furnished with a long point.

Perichætal leaves none; at least, there are none that differ in the slightest degree, either in shape or direction, from the rest.

MALE FRUCTIFICATION hitherto unknown.

FEMALE FRUCTIFICATION originating from the under side of the stem, and beneath the stipule.

Calyx: this, in a young state (f. f. 6. 7. 8), is cup-shaped, and situated upon a short curved footstalk; its margin scaly or slightly foliaceous; its base very thick and carnosæ; within are the pistilla (f. 7): in proportion as it advances to its full size, the thick base descends, and at length forms a hollow oblong pouch or sack, nearly a line long (f. 10); the point of attachment of which with the stem is seen to be at the margin: the mouth is a little expanded, and the scales there situated are, before the exertion of the peduncle, incurved: this calyx is imbedded in the earth among the mosses and Jungermanniæ to which the plant may happen to be attached; it is smooth, or presents only short, minute, and irregular striæ on its outer surface; its *color* is a dirty white.

Pistilla (f. f. 7. 9) seven or eight in number, lanceolate; the mouth a little expanded.

Calyptra (f. 11) whitish, thin, membranaceous, reticulated; when it has reached its full size, about three-fourths of the length of the calyx, to the inside of which it is closely appressed, if not attached; for I cannot separate the one from the other without injury: the apex is crowned with a short *style*.

Peduncle about an inch or an inch and a half long, white, cylindrical, cellulose, tipped with the brown oblongo-ovate

Capsule, which opens into four narrow strait valves, divided by a number of transverse and longitudinal furrows, and the interstices again marked by dark lines running in similar directions (f. 13).

Seeds and spiral filaments (f. 14) fulvous: the former spherical; the latter formed of a double *helix*, rather closely twisted.

Almost all the above synonyms I have quoted in compliance with the opinion of preceding Botanical authors, rather than from any conviction of the propriety of so doing: so vague and unsatisfactory are the descriptions with which they are accompanied. Two alone can be depended upon with any degree of certainty; the Michelian figure, and that of *English Botany*. From the circumstance of *Linnaeus*' having referred to the really excellent figure of Micheli, there is reason to believe that he intended the same plant; yet, how strange it is, that he should have described it in the *Species Plantarum* "*foliolis subulatis*!" This, we are informed*, the illustrious author had

* See Dr. Smith in *English Botany*, p. 2513.

erased in his own copy, but in the *Systema Naturæ* he has fallen into an error equally great, in describing the species "foliis planis nudis linearibus." In the character given by Necker, there is nothing to distinguish *J. viticulosa* from many other species; and Pollich appears rather to have had some slight variety of *J. asplenoides* in view, when he says, "Folia disticha, fere orbicularia, margine modò integerrima sunt, modò etiam levitèr denticulata apparent." Weis, too, describes the leaves "margine ciliato;" whilst Weber says, that they are to be distinguished from those of *J. asplenoides* by their being entire.

No author whatever appears to have been acquainted with the fructification of this singular species; the honor of discovering it was reserved for Miss Hutchins and Mr. Lyell; the former of whom has alone detected perfect capsules. The stipules too, which are far from being inconspicuous, have escaped the notice of every writer upon the subject, but Dr. Smith.

The curious structure and situation of the calyx are peculiarities which *J. viticulosa* has in common with a species, in other respects widely different, brought by Mr. Menzies from New Zealand, as well as with one of our own country, *J. Trichomanis*, to which indeed it is in other respects likewise closely allied. The differences to be observed are, the pale color, the very cellular texture, the convex leaves, the simply emarginate stipules, and the linear or cylindrical figure of the capsule of *J. Trichomanis*, which species moreover has the valves of the capsule twisted in a very remarkable manner. All of these characters, as may be seen by the above description, are inapplicable to our *J. viticulosa*.

Dillenius was ignorant of this species. His figure quoted for it in *Hist. Musc.* is *J. polyanthos*, which he has represented twice.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. viticulosa</i> , natural size.	
2. The same, magnified	6
3. Portion of the stem, with leaves and stipules, seen on the under side	5
4. Leaf	4
5. Stipules	3
6. Under side of a fertile shoot, with the young calyces	5
7. Calyx, with a portion cut away to exhibit the pistilla	3
8. A young calyx, entire	3
9. Pistilla	1
10. Perfectly formed calyx	3
11. The same, longitudinally dissected to shew the calyptra and the peduncle	2
12. Portion of the calyx, shewing its internal structure	1
13. Portion of the valve of a capsule	1
14. Seeds and spiral filaments	1





Jungermannia scalaris.
Jungermannia scalaris Schmid, *Verh.*

JUNGERMANNIA SCALARIS.

(TAB. LXI.)

JUNGERMANNIA, caule repente, simplice: foliis rotundatis, concavis, integris emarginatisque; stipulis latè subulatis: fructu terminali; calyce perichætio immerso.

Jungermannia scalaris. SCHRADER, *Samml.* II. p. 4. HOFFMANN, *Germ.* II. p. 89? ROTH, *Germ.* III. p. 374?

Jungermannia lanceolata. *Engl. Bot. t.* 605.

HAB. Abundant, upon a loamy soil, in woods, barren wastes, and hedge-banks.

PLANT growing in patches, covering a considerable surface of ground; the individuals generally densely crowded.

Root consisting of small, whitish bundles of fibres, originating from the lower surface of the stem, and near the base of the stipules.

Stems from a quarter to half an inch, or sometimes more, in length, simple, or rarely producing innovations, filiform, rather wide in proportion to their length, flexuose, distinctly cellular, of a pale green color.

Leaves more or less closely placed in a distichous manner, patent and horizontal, (f. f. 4. 10) or erect (f. 7): they vary in length from a quarter to half a line, the smaller ones being found in general near the base, and at the extremity: they are of a roundish figure, concave above, at the base semi-amplexicaul, for the most part having the margin entire: but, in some individuals, the whole (f. 8), in others, a few only, placed here and there, without any kind of regularity, are emarginate at their apices. Their color accords with that of the stem: the *cellules* are small, roundish, sometimes obtusely quadrangular at the margin, but not strikingly larger than in the disk of the leaf.

Stipules (f. f. 9. 12) small, of a widely subulate shape, agreeing in color and texture with the leaves.

Perigonal leaves (f. 5) scarcely differing from the rest, except in having a swollen base, and the lower margin a little incurved on the upper side of the stem.

(*J. scalaris*.)

BRITISH JUNGERMANNIÆ.

Perichæatial leaves larger than the cauline, emarginate and waved, united together for one-third of their length from the base, so as to form a hollowed receptacle, which may almost be considered an exterior calyx (f. f. 10. 11. 13. 14).

MALE FRUCTIFICATION.

Anthers (f. 6) of a spherical shape, reticulated, pedicellate: two or three are placed in the axilla of each perigonial leaf.

FEMALE FRUCTIFICATION always terminal.

Calyx (f. f. 13. 14) ovate, closely attached, by its external surface, to the interior surface of the tube or hollowed receptacle, formed by the perichæatial leaves, the extremity alone or mouth being free; this is cut into four large and equal-sized teeth or wide segments, which scarcely rise above the perichætium. The texture is more delicate than the leaves: the color a pale and dirty brown.

Germen ovate (f. 13), dark green, surmounted by a short, tubular style.

Calyptra ovate, membranous, reticulated.

Peduncle from a quarter to half an inch, or upwards, in length, white, pellucid, striated both transversely and longitudinally.

Capsule between roundish and ovate, dark brown, deeply furrowed longitudinally from the apex to the base, and these furrows connected by transverse ones: it opens into four equal ovate valves.

Seeds and spiral filaments (f. 16) of a dark brown or chocolate color: the former spherical; the latter composed of a double helix.

Obs. No *Gemmae*, that I am aware of, have yet been found on this species; but its leaves, like those of *J. Taylora*, produce a minute, black, hispid, nearly spherical fungus, attached usually to the upper surface of the leaf, and sometimes to the margin. This, when broken, gives out a semi-transparent pulpy substance, among which I can discover no traces whatever of seeds or granules. (See f. f. 4. 10. 17. 18. 19.)

The present species, although among the most common that this country affords, appears nevertheless to be little known, and is no where, that I can find, described with the accuracy which the curious structure of the calyx richly deserves. It has, indeed, a considerable affinity, in the form of its leaves in general, to *J. Taylora*, as well as to *J. pumila*, *J. sphaerocarpa*, *J. hyalina*, *J. lanceolata*, and *J. crenulata*. From the first of these, it may be known by its much smaller size, and more compactly cellular texture; from the rest, by the presence of the stipules; and, from the whole, by the immersed calyx, in which particular it approaches *J. emarginata*, *J. juniperina*, and a few more, which are, in other respects, abundantly distinct.

Schmidel appears to be the earliest author who has described a *Jungermannia* under the name of *scalaris*: but I have little hesitation in pronouncing his plant, as well from the figure, as from his own account of it, to be no more than the gemmiferous state of *J. Trichomanis*, as is, indeed, the case with the *J. scalaris* of most other authors. Specimens, however, from Schrader himself,

BRITISH JUNGERMANNIÆ.

(*J. scalaris*.)

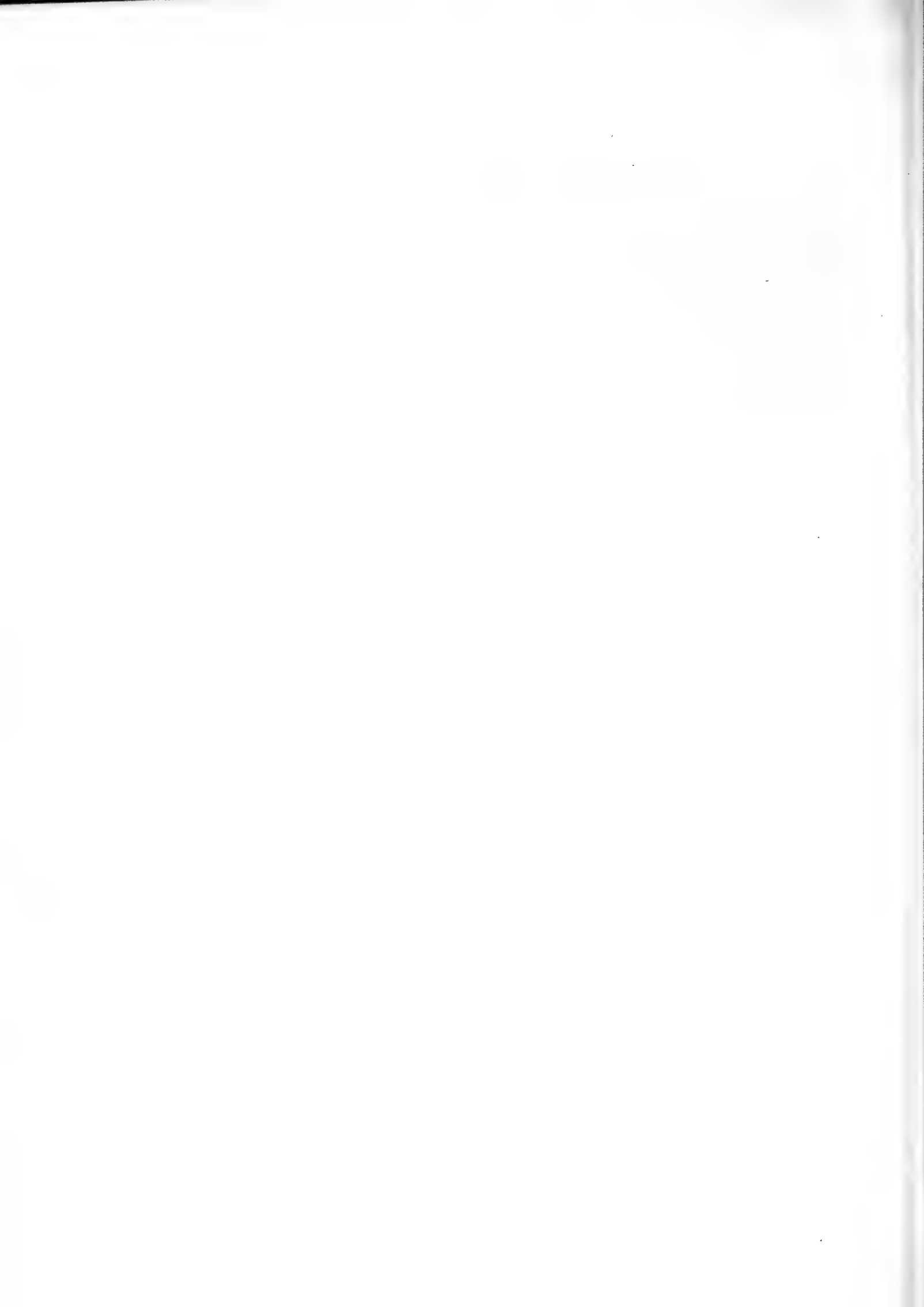
preserved in Mr. Turner's Herbarium, prove the *J. scalaris* of his *Syst. Samml.* to be the same as the one here represented, but still I dare not venture to quote Hoffmann and Roth's plants without considerable doubt. It seems possible that the former may be our *J. Trichomanis*, but there is no mention made of the fructification; and the calyx of *J. scalaris*, as described by Dr. Roth, appears rather to accord with *J. crenulata*, which that writer probably confounded with it. No author, whatever, has remarked the stipules.

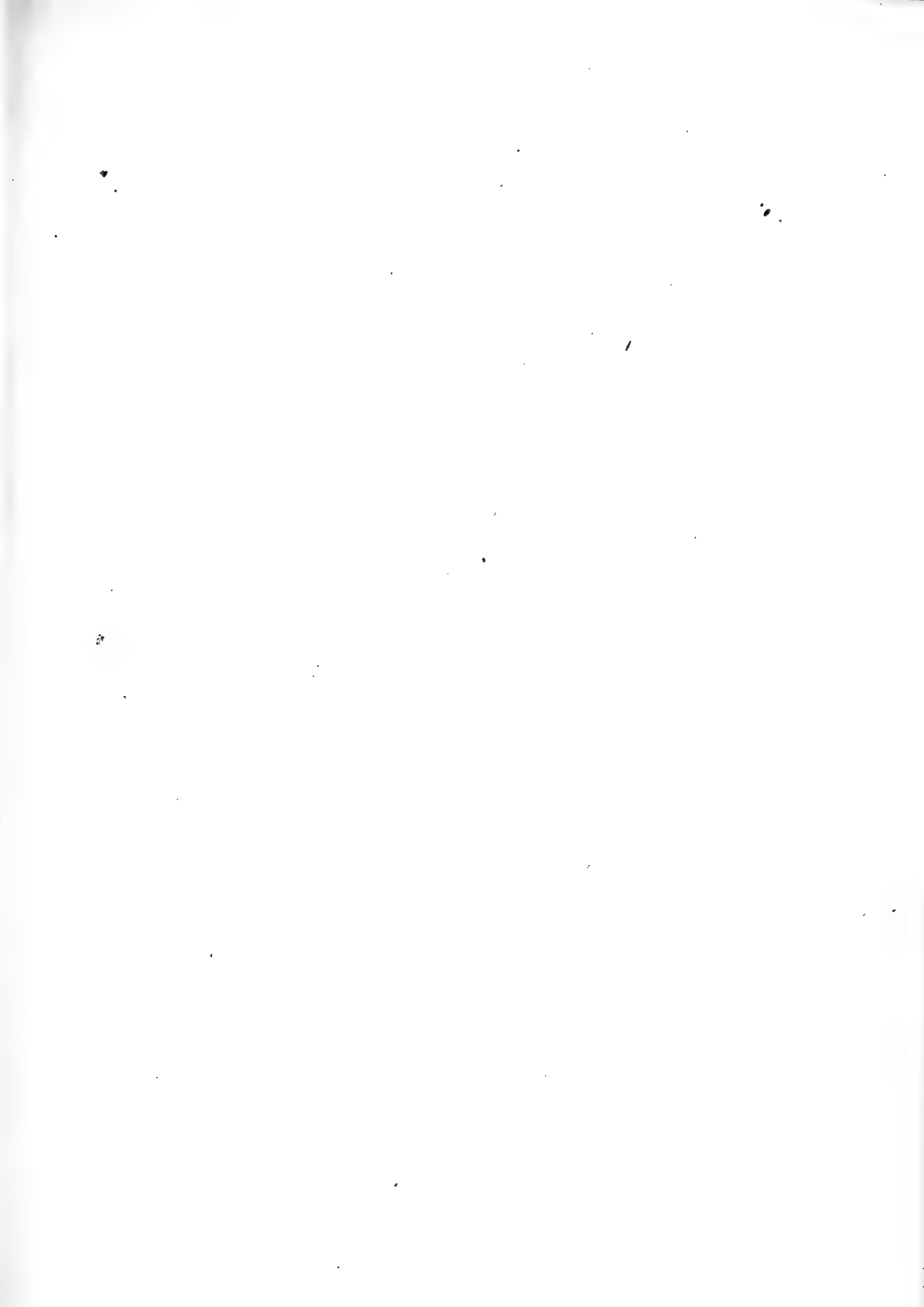
J. scalaris is represented in *English Botany* under the name of *lanceolata*; but the unmagnified figures are taken from unusually luxuriant specimens, and are much larger than any individuals that have fallen under my own observation.

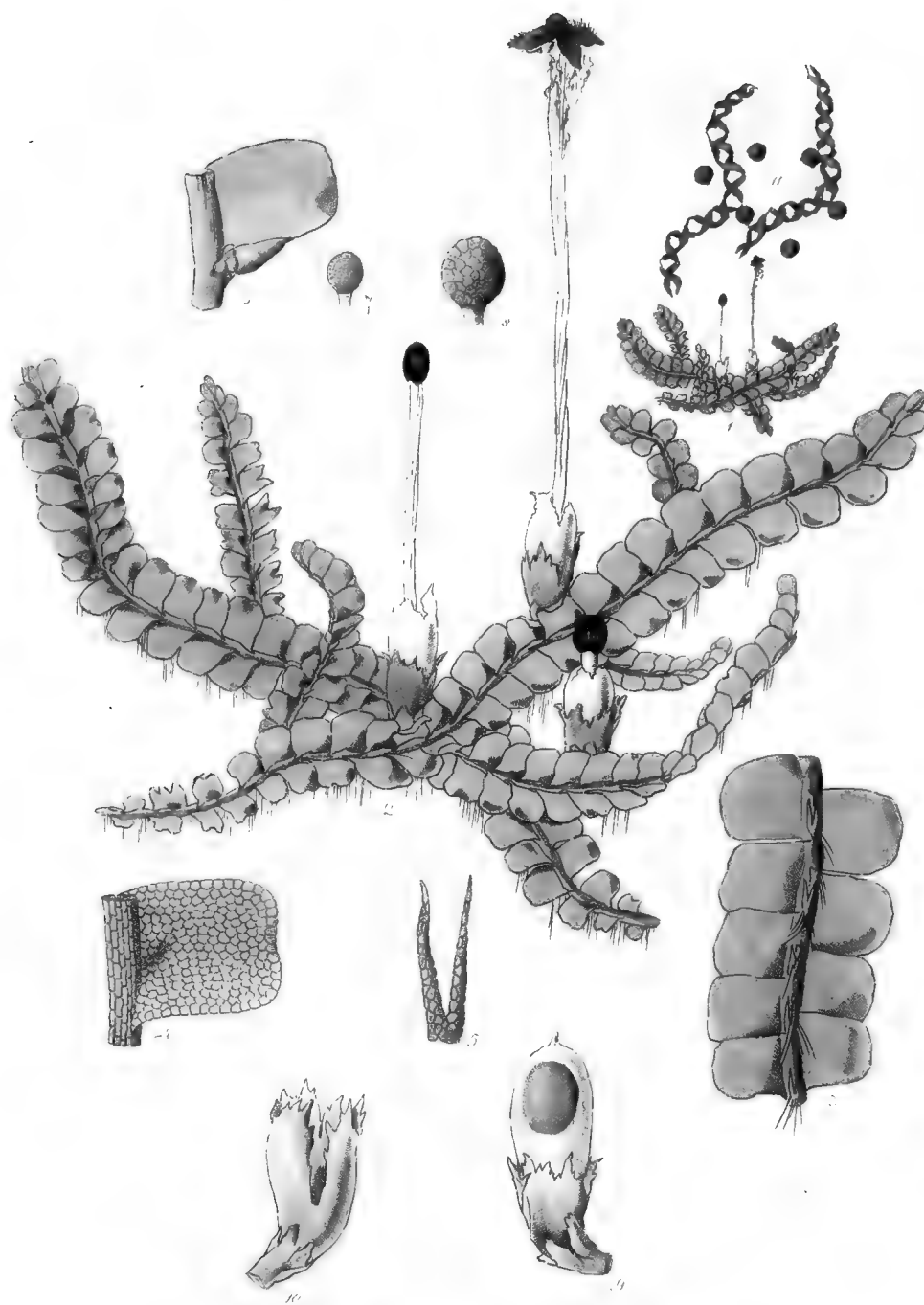
REFERENCES TO THE PLATE.

FIG.

1.	<i>J. scalaris</i> , male plant, natural size.	
2.	Female plant, natural size.	
3.	Barren shoot.	
4.	Male plant, magnified.....	6
5.	Perigonial leaf and Anthers.....	3
6.	Anther	1
7.	Barren shoot, with erect leaves	6
8.	Var. with emarginate leaves	6
9.	View of the under side of the stem, shewing the stipules	6
10.	Female plant	6
11.	Calyx and perichætium	5
12.	Stipule	1
13. 14.	Calyx and perichætium longitudinally opened	3
15.	Capsule, after the discharge of the seeds	3
16.	Seeds and spiral filaments	1
17.	Leaf, with its parasitic Fungus	4
18.	The Fungus detached from the leaf	1
19.	The same, burst	8







Jungermannia polyanthos.
Jungermannia polyanthos L. f.

Alonso L. Lirio

JUNGERMANNIA POLYANTHOS.

(TAB. LXII.)

JUNGERMANNIA, surculo procumbente, subramoso: foliis bifariis, subimbricatis, horizontalibus, planis, rotundato-quadratis, integris emarginatisque; stipulis oblongis, bifidis: fructu in ramis propriis, ex parte inferiore caulis egredientibus, laterali; calycibus calyptrâ dimidio brevioribus, bilabiatis, laciniatis.

Jungermannia polyanthos. LINN. *Sp. Pl.* p. 1597. *Syst. Nat.* II. p. 705. SCHRANK, *Bavar.* II. p. 459. POLLICH, *Palat.* III. p. 178. WEIS, *Plant. Crypt.* p. 113. LEERS, *Herb.* p. 249. VILLARS, III. p. 493. HOFFMANN, *Germ.* II. p. 88. ROTH, *Germ.* III. p. 372. OEDER, *Enum. Pl. Fl. Dan.* p. 41. HUDS. *Angl.* p. 510. LIGHTF. *Scot.* II. p. 773. WITH. III. p. 855. LAMARCK, *Encycl. Bot.* III. p. 279. LAMARCK, *Fl. Fr. ed. 2.* II. p. 431. LAMARCK, *Fl. Gall.* p. 92. *Engl. Bot. t.* 2479. LINN. *Syst. Nat. ed Gmel.* II. p. 1348.

Jungermannia viticulosa. β. WEBER, *Spic. Fl. Goet.* p. 133.

Jungermannia aquatica. SCHRANK, *Bavar.* II. p. 496. LINN. *Syst. Nat. ed. Gmel.* II. p. 1349.

Jungermannia fragilis. ROTH, *Germ.* III. p. 370. EHRH. *Crypt. Exsic. n.* 48.

Jungermannia pallescens. SCHRADER, *Syst. Samml.* II. p. 7. HOFFMANN, *Germ.* II. p. 87. ROTH, *Germ.* III. p. 394.

Lichenastrum trichomanoides aquaticum odoratum fontis S. Winifridæ. RAI Syn. p. 112.

Hepaticoides polytrichi facie. *Muscus trichomanoides, foliis rotundioribus, pallidis, squamatum conjunctim sibi incumbentibus.* VAILLANT, *Bot. Par. tab.* XIX. f. 7.

Jungermannia major, foliis brevioribus, et obtusioribus, non dentatis. MICH. *Nov. Gen.* p. 8. t. 5. f. 3.

Lichenastrum Trichomanis facie, polyanthemum, breve et repens. DILL. *Musc. t.* 70. f. 9.

Lichenastrum Trichomanis facie, e basi et medio florens. DILL. *Musc. t.* 69. f. 7.

Lichenastrum trichomanoides aquaticum odoratum fontis S. Winifridæ. DILL. *Musc. t.* 69, f. 8.

Jungermannia foliis pinnatis, ovatis, ex caule florifera. HALL. *Helv.* III. p. 60.

HAB. Moist and very wet places in various parts of Great Britain. (It is particularly abundant upon rocks and stones in clear and rapid streamlets, producing fructification, both male and female, in April and May).

(*J. polyanthos.*)

BRITISH JUNGERMANNIÆ.

PLANT generally growing in rather loose and straggling patches, easily detached from its native soil.

Roots more or less abundant upon different individuals, issuing in small tufts from the under side of the

Stems, which are either wholly procumbent, or at the apices only inclined to be ascendant, filiform, flexuose, from one to two inches, or more, in length, simple, or once or twice irregularly branched; frequently, also, producing innovations, which, at an advanced period, are scarcely to be distinguished from the branches themselves.

Leaves rather closely, but still alternately, placed in two rows, somewhat imbricating each other with their margins, horizontal in their direction, about half a line in length, but decreasing in size from the middle towards the base, as well as towards the extremity; of a nearly quadrate figure, with the angles obtuse; their surface is plane, or but slightly convex; the base decurrent at the lower margin; the extremity entire in most instances, though often emarginate, especially upon the innovations, the notch varying from obtuse to acute. Once or twice I have observed a leaf to have two of these notches, thus forming a trifid leaf, which, indeed, may have arisen from an accident. The *texture* is delicate; the *cellules* of a roundish form: the *color*, for the most part, a pale green, varying in intensity, in sheltered and exposed situations.

Stipules (f. 5) of a narrow lanceolate form, divided nearly down to the base, into two entire, subulate, strait segments. Under a microscope they exhibit the common reticulated appearance of the leaves, which they further resemble in their color.

Perigonal leaves mostly situated at the extremity of the plant, eight or ten, or more, in number, resembling the cauline ones in every thing, except in having their base swollen for the reception of the Anthers (f. 8).

Perichætal leaves (f. f. 9. 10) very small, ovate, obtuse, unequally serrated at their margins: a few of these, rather resembling scales than leaves, surround the base of the calyx, and are only seen upon the proper calycine stalk.

MALE FRUCTIFICATION in the axillæ of the perigonal leaves.

The *Anthers* are spherical, reticulated, of a pale greenish or olive color, situated upon short whitish footstalks.

FEMALE FRUCTIFICATION upon short proper footstalks, resembling small ramuli, which originate from the under side of the plant, and, from a bent or curved base, become erect.

Calyx very short, scarcely half so long as the calyptra; at the base cylindrical, compressed towards the extremity, widely ovate, truncate, split into two lips, each of which is variously cut and lacinated at the margin: the clefts, it may be observed, are unequal; that on one side extending to about three-fourths of the length of the calyx, while the opposite one is scarcely half so deep (f. f. 9. 10).

Calyptra (f. 9) exserted, twice the length of the calyx, oblongo-obovate, white, membranaceous, semi-pellucid, reticulated, tipped at the extremity with the short tubular *style*.

Peduncle scarcely an inch in length, white, cellular.

Capsule ovate, approaching to orbicular, of a brown color, marked with longitudinal and transverse furrows.

Seeds (f. 11) spherical: both they and the *spiral filaments*, which are composed of a double *helix*, are of a fulvous color.

BRITISH JUNGERMANNIÆ.

(*J. polyanthos*.)

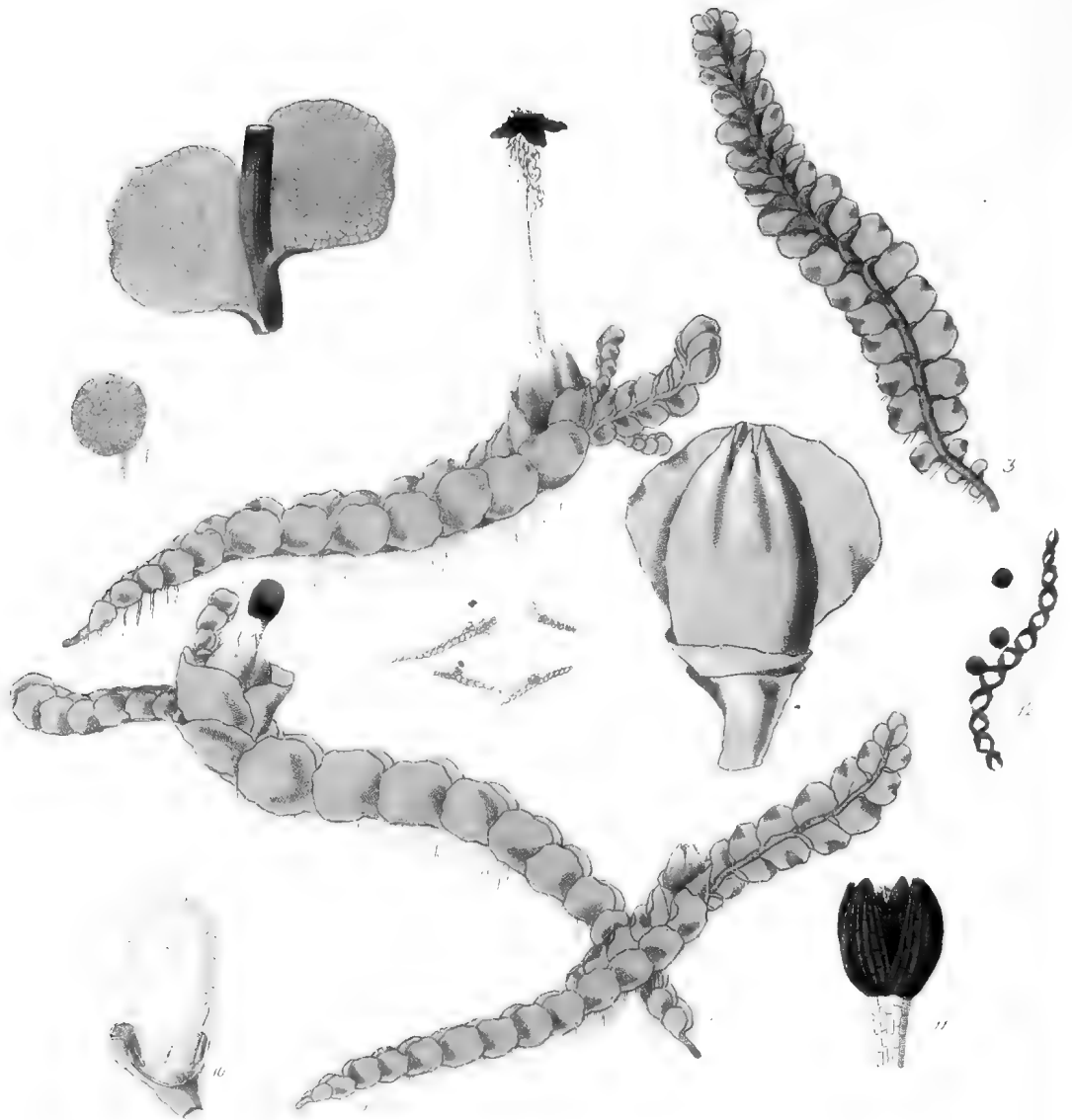
When found in a state of fructification, there are, perhaps, few individuals of the genus that may be so readily distinguished as the present; its exserted corolla, and its truncate and bilabiate calyx, affording characters no less decisive than remarkable. The leaves, also, seem very constantly to retain their subquadrate form; and, though they may in some instances be as much emarginate as those of *J. heterophylla*, yet still their general figure, and their being so much more frequently entire, furnish sufficient marks of discrimination. In addition to this, it may be further remarked, that the stipules, which in *J. heterophylla* are much lacinated, are in *J. polyanthos* always entire.

The Michelian figure above referred to is a tolerably accurate representation of our plant, indeed much more so, as it appears to me, than that cited by Dillenius (t. 5. f. 5), which I have consequently omitted. The author last mentioned, if I may be allowed to judge from his own specimens, has described this species no less than three separate times in his *Species Muscorum*. Of these, his t. 69. f. 7. has always, though incorrectly, been regarded as *J. viticulosa*. The figure of Vaillant, bad as it is, bears a greater resemblance to the plant in question, than to *J. asplenioides*, under which species it has, in the writings of most Cryptogamists, found a place. Weis and Pollich, and even Linnæus himself, have been singularly unsuccessful in their description of this species; nor does the fructification appear to be any where described with accuracy, till Schmidel published his valuable "*Dissertationes*," whence Roth seems to have drawn his characters. Schrader's *J. pallescens*, specimens of which have been communicated by the author himself to Mr. Turner, proves to be in no respect different from *J. polyanthos*.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. polyanthos</i> , male and female, natural size.	6
2. The same, magnified.	6
3. Portion of the stem with its leaves, seen from beneath, in order to shew its stipules.	4
4. Leaf.	3
5. Stipule.	2
6. Perigonal leaf, with its Anthers.	4
7. 8. Anthers.	1
9. Calyx and corolla.	4
10. Calyx.	4
11. Seeds and spiral filaments.	1



Fungermannia hyalina.

Usplozie hyalina (Am).

Usplozie hyalina (Am) 1877

JUNGERMANNIA HYALINA.

(TAB. LXIII.)

JUNGERMANNIA, caule ascendente, flexuoso, dichotomo: foliis erecto-patentibus, rotundatis, subundulatis: fructu terminali; calycibus ovatis, angulatis; ore contracto, quadridentato.

Jungermannia hyalina. LYELL, M.S.S.

HAB. Boggy places in the New Forest, Hants.; and among the rocks immediately above Stock-gill Force, a waterfall near Ambleside. *Mr. Lyell.*—Sefing mountain, near Dublin. *Dr. Taylor.*—(It bears fruit in the early spring months.)

PLANT forming broad tufts of a deep green:—if unexamined, it might be easily passed by as *J. undulata* in a dwarf state, though its shining and glassy appearance is likely to attract the eye of the Botanist, who is at all conversant with the genus.

Roots dense, simple, pellucid fibres, proceeding generally from the whole length of the under side of the stem, which latter, as well as the roots, is of a deep purple.

Stem either wholly procumbent, or, as is much more frequent, ascendant in the greater part of its length, simple, or much branched with innovations, so as to look dichotomous.

Leaves (f. 8) bifarious, rather distantly placed, erect or erecto-patent, loosely imbricated, round, embracing the stem, and in places often concealing it; their *texture* extremely thin, membranous, shining and subdiaphanous; the *cellules* round, the marginal row being largest; *color* a deep bright green.

Perigonal leaves (f. 3) situated near the extremity of the stem, undulated like the rest, and differing in no respect, but in having a swollen or ventricose base.

The *Perichætil leaves* (f. 9), which sometimes extend far below the apex of the stem, enlarge upwards from their base, so as to be broadly ovate, and are also undulated.

MALE FRUCTIFICATION (f. 3) in the axillæ of the perigonal leaves.

Anthers spherical, of a pale, olive-brown color, reticulated, placed upon a short white footstalk.

FEMALE FRUCTIFICATION (f. f. 6. 7. 9) terminal upon the stems.

Calyx (f. 9) ovate, broad at the base, bluntly angular, the *mouth* contracted, cut into four teeth.

(*J. hyalina*.)

BRITISH JUNGERMANNIÆ.

Calyptra (f. 10) ovate, membranaceous, reticulated, tipped with a short hollow *style*.

Peduncle a quarter or half an inch long, white, striated.

Capsule (f. f. 6. 11) ovate, broad, approaching to round, of a deep brown color, furrowed both longitudinally and transversely.

Seeds and spiral filaments (f. 12) chocolate colored; the former spherical, the latter composed of a double *helix*.

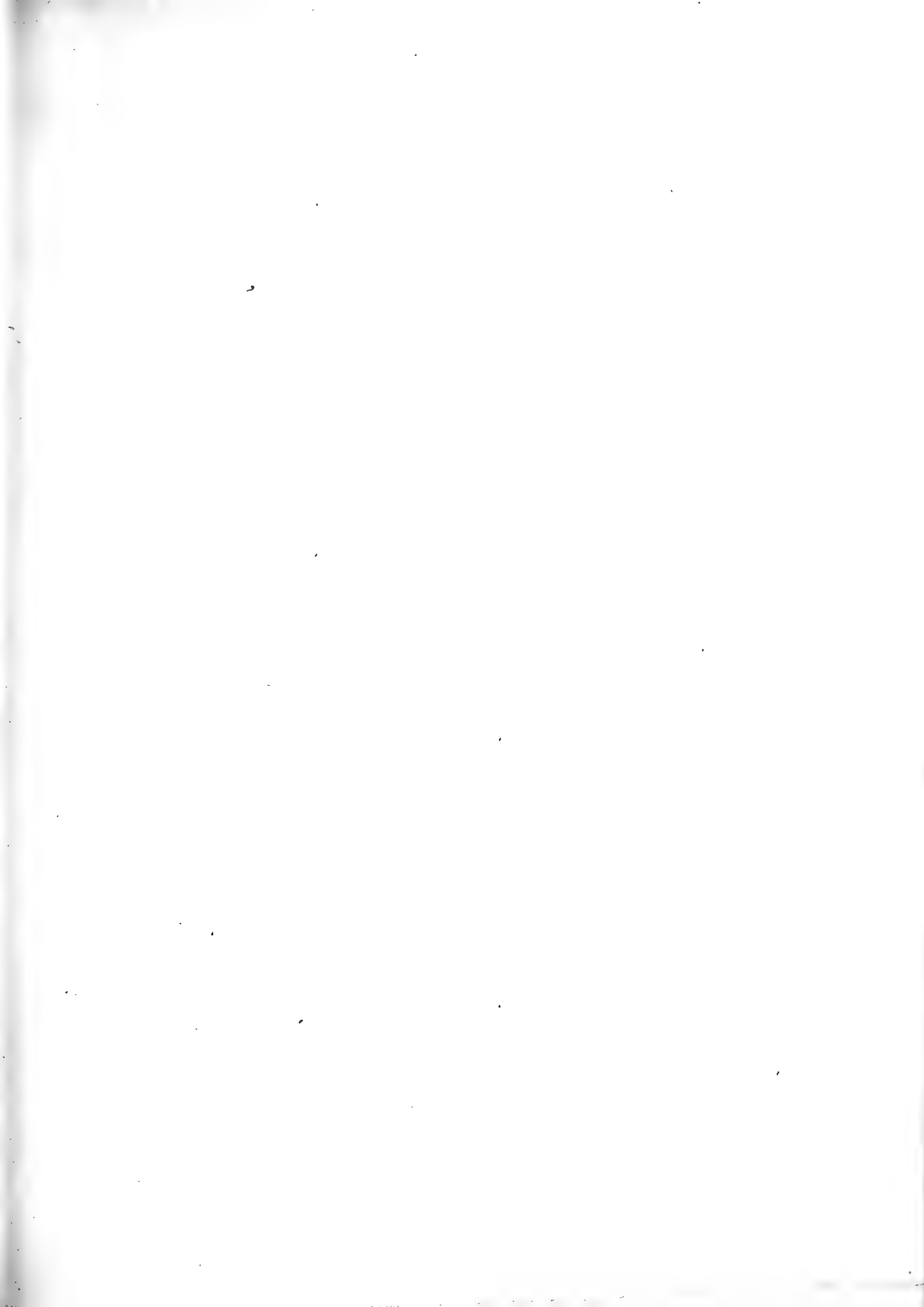
OBS. The texture of the leaves in *J. hyalina* is exactly similar to that in *J. cordifolia*, and their position and habit often bear great resemblance to those of that plant, but their figure never approaches to cordate. In general shape and position, they are by far more like the leaves of *J. scalaris*, as well in its plane as waved state; but in their texture nothing can be more different. The fruit is, strictly speaking, terminal, as in *J. pumila*, a near, though diminutive, relation of our plant, as the bend in the stem, whenever the fruit appears lateral, indicates that it is seated between an older and a younger shoot; but calyces so placed, and also terminal ones, are observable nearly of the same age on the same plant. *Lyell's M. S.*

To the above excellent character and description of *J. hyalina*, for both of which I am indebted to my friend, Mr. Lyell, by whom they were made from fresh specimens, it is needless for me to add any thing, except my hearty concurrence in his opinion, that the plant is decidedly distinct from the species just mentioned, as well as from every other in the genus.

REFERENCES TO THE PLATE.

FIG.

1. Male plant, natural size.	
2. Female plants, natural size.	
3. Male plant, magnified.....	6
4. Anther	1
5. 6. 7. Female plants, magnified.....	6
8. Leaves.....	4
9. Calyx, with perichæatial leaf	3
10. Calyptra	2
11. Capsule, not yet open	5
12. Seeds and spiral filaments	1





Jungermannia cuneifolia.
C. M. v. s. 1848

JUNGERMANNIA CUNEIFOLIA.

(TAB. LXIV.)

JUNGERMANNIA, caule repente, simplice: foliis subdistantibus, cuneiformibus, integerrimis, vel apice obtusissimè emarginatis: stipulis minutis, ovatis, acutis, bifidis.

HAB. Found growing parasitically upon *Jungermannia Tamarisci*, near Bantry, by Miss Hutchins.

PLANT so minute as to resemble the filaments of a *Conferva*, rather than the stems of a *Jungermannia*; growing loosely clustered.

Roots consisting of a few small fibres, which proceed in tufts from the under side of the stem, and always at the base of a stipule.

Stems extremely slender, filiform, rarely exceeding half an inch in length, generally much smaller, and, as far as I have had the opportunity of observing, undivided, of a brownish color; when dry exceedingly fragile; *cellules* small and oblong.

Leaves (f. f. 4. 5. 6), throughout the whole length of the plant rather distantly placed, scarcely the eighth of a line long, patent or erect, of an exactly cuneiform figure; the base decurrent; the apex entire, or cut into a wide, but very shallow notch; the margin every where destitute of teeth or serratures. The *cellules* are roundish: the *texture*, when dry, brittle: the *color*, in all the specimens that I have seen, a dull reddish olive or brown.

Stipules (f. f. 5. 7) one to each pair of leaves, rather closely appressed to the under side of the stem, small, of an ovate form, divided for more than half its length, by an acute sinus, into two sharp segments. Its *color* and *texture* the same as in the leaves.

(*J. cuneifolia*.)

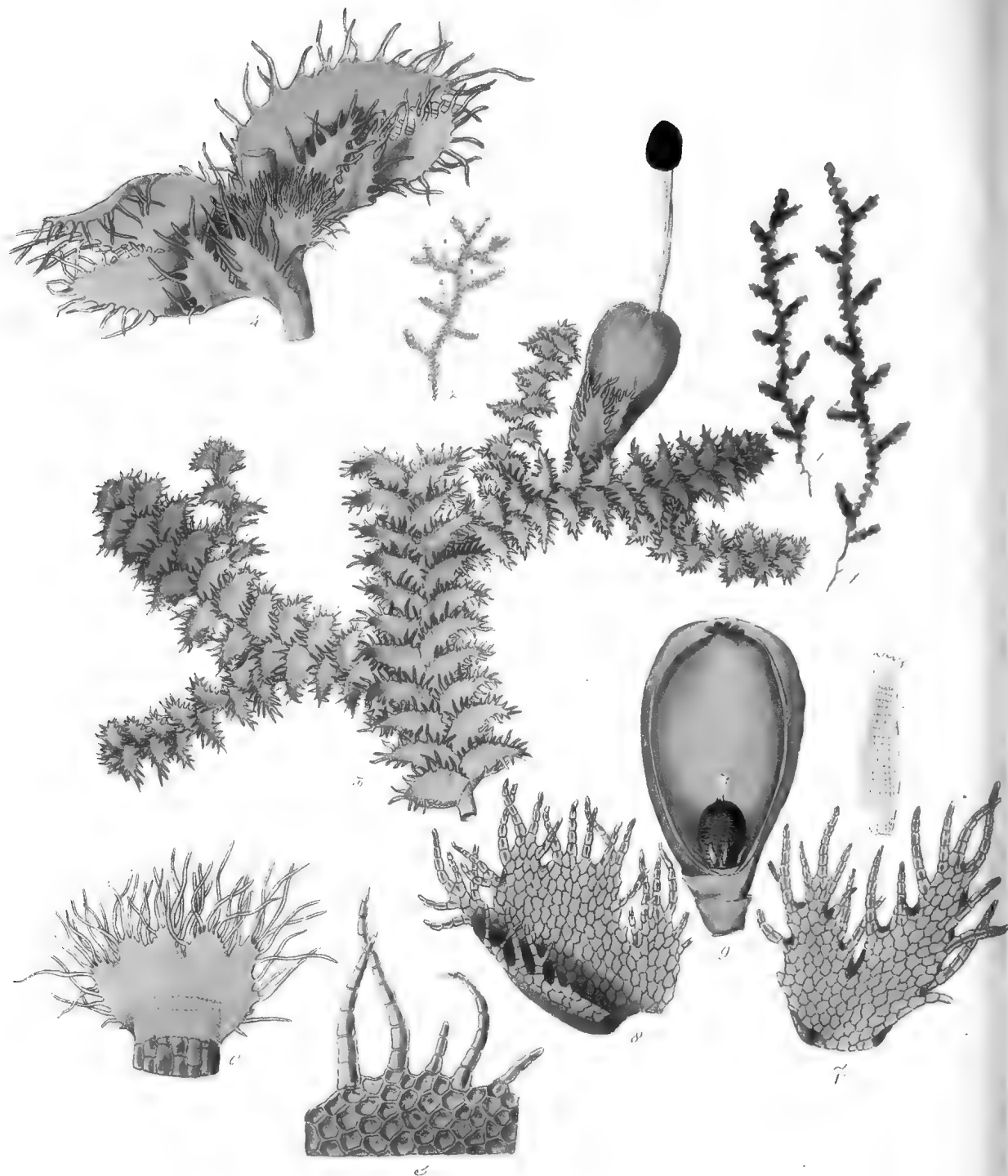
BRITISH JUNGERMANNIÆ.

Of the present curious little plant no fructification has at present been found; nor indeed is it at all necessary for the distinguishing of the species, the leaves and stipules affording abundant characters by which it may be known from every other in the genus. Neither is it an easy task to determine to which it is most naturally allied. In the narrowed base of the leaves it has an affinity with *J. spinulosa*: in size, color, and texture, with *J. byssacea*: but the stipules require that it should be arranged in quite a different family, where there is none for which it can be mistaken.

REFERENCES TO THE PLATE.

FIG.

1. *J. cuneifolia*, natural size, growing upon *J. Tamarisci*.
 2. Detached individuals, natural size.
 3. Stems, magnified 6
 4. Portion of a stem, and leaves 4
 5. The same, shewing the under side, with the stipules and roots 4
 6. Stem and leaves 2
 7. Stipules 2
-



Jungermannia ciliaris.
H. ciliaris (L.) Hedw.
H. ciliaris (L.) Hedw.

JUNGERMANNIA CILIARIS.

(TAB. LXV.)

JUNGERMANNIA, caule procumbente, pinnatim ramoso: foliis bifariam imbricatis, valdè convexis, inæqualitèr bilobis; lobis lobulisque bipartitis, longè tenuitèrque ciliatis: stipulis subquadratis, inæqualitèr lobatis, longissimè ciliatis: fructu laterali; calycibus obovatis; ore contracto, dentato.

Jungermannia ciliaris. LINN. *Sp. Pl.* p. 1601. *Syst. Nat.* II. p. 706. *Fl. Suec.* p. 402. *Fl. Lapp.* p. 342. POLLICH, *Pal.* III. p. 197. LEERS, *Herb.* p. 251. EHRH. *Beitr.* II. p. 149. OEDER, *Enum. Pl. Fl. Dan.* p. 42. WILLD. *Berol.* p. 342. HOFFM. *Germ.* II. p. 84. ROTH, *Germ.* III. p. 400. DICKS. *Pl. Crypt. Fasc.* II. p. 14. WEBER and MOHR, *Crypt.* p. 413. (fide WAHL.) WAHL. *Lapp.* p. 385. *Engl. Bot. t.* 2241.

Jungermannia pulcherrima. WEBER, *Spic. Fl. Goet.* p. 151. SWARTZ, in *Amœn. Acad.* X. p. 116. SWARTZ, in *Act. Nov. Ups.* IV. p. 244. HOFFM. *Germ.* II. p. 83. LAMARCK, *Encycl. Method.* III. p. 285. LINN. *Syst. Nat. ed. Gmel.* II. p. 1352. WITH. III. p. 861. DICKS. *Pl. Crypt. Fasc.* I. p. 7.

Jungermannia Leersii. ROTH, *Germ.* III. p. 402.

Lichenastrum scorpioides, pulchrum, villosum. DILL. *Musc. t.* 69. *f.* 3.

HAB. Among rocks and in heathy places, especially in subalpine countries, abundant.

PLANT growing in densely-matted, purplish-brown patches, of considerable size.

Stems, varying from one to two or three inches in length, procumbent, or rarely (and only, I believe, when growing among tall mosses) suberect, flexuose, filiform, about as thick as horse-hair, furnished, at rather distant intervals, with short, obtuse, patent, alternate pinnæ, which are frequently simple, but at other times beset with one or two small pinnulæ. The color is a yellow-brown, varying to green in the younger shoots; the substance fragile when dry.

Leaves (f. 4) more or less densely-crowded, imbricating each other in a bifarious manner over the upper surface of the stem; about half a line long, and not sensibly smaller towards the apices of the stem and pinnæ than in the other parts of the plant. They are of a roundish,

(*J. ciliaris*.)

BRITISH JUNGERMANNIÆ.

or subquadrate figure, distinctly divided into two, unequally-sized, conduplicate lobes; of which the upper one is the largest, very convex on its upper surface, and cleft, for about half its length, into two, rather acute segments; the lesser lobe, which is nearly plane, and not more than one third of the size of the other, is in like manner divided into two lanceolate and acute segments: the whole are elegantly bordered with long, capillary, flexuose cilia, which I have, in two or three instances, observed to be forked, and which are, throughout their whole length (f. 5), jointed in the same manner as the filaments of a *Conferva*. The *cellules* of the leaves are roundish and closely placed. The *color* is, in sheltered places only, a brownish-green; in exposed situations a purplish-brown, generally deeper towards the extremities.

Stipules (f. 6) of a widely quadrate figure, broader than the stem, to which they are appressed; at the end unequally lobed, and there, as well as along the whole margin, bordered with closely-placed, long cilia, narrower than those of the leaves, to which, in other respects, they are similar.

Perichætal leaves (f. f. 7. 8); of these two or three are placed at the base of each calyx, and closely appressed to it. They are widely ovate, cut into two or three unequal segments, and ciliated along their borders.

MALE FRUCTIFICATION at present unknown.

FEMALE FRUCTIFICATION lateral upon the pinnulæ, near the middle of which they are usually situated.

Calyx of a more thin and delicate texture than the leaves, of an obovate form, having the mouth small, much contracted, and beset with small unequal teeth (f. 9).

Germen (f. 9) ovate, style long.

Pistilla (f. 10) numerous, surrounding the base of the germen, linear-lanceolate, expanded at the mouth, of a pale greyish color, streaked longitudinally and transversely with darker lines, and having also a few reddish streaks.

The *capsule* and *spiral filaments* I have not had the opportunity of seeing myself, and therefore have copied the description of them from Hoffmann, who describes the former as being ovate, approaching to round, of a deep brown color, and the latter, as well as the *seeds*, of a subfuscous color.

The present very elegant species, which is not only common in this country, and upon the continent of Europe, but has even been brought from Greenland, according to Dillenius, is likewise found at Kamtchatka by Dr. Tilesius, and has been by him communicated, with some other well-known European species of *Jungermannia*, from that country, to Mr. Dawson Turner. Yet, abundant and general as it is, it was unknown to the botanical world till Dillenius figured and described it in his *Historia Muscorum*. The name of *ciliaris* was adopted by Linnæus, who, from giving a wrong reference to Vaillant and Dillenius, has led subsequent authors into an error, and has been the means, if not of causing Weber, Weis, Hudson, Lamarck, and Withering, to mistake *J. tomentella* for *J. ciliaris*, at least of leading them to confound the two species; for the descriptions of many of the above authors will apply equally to either.

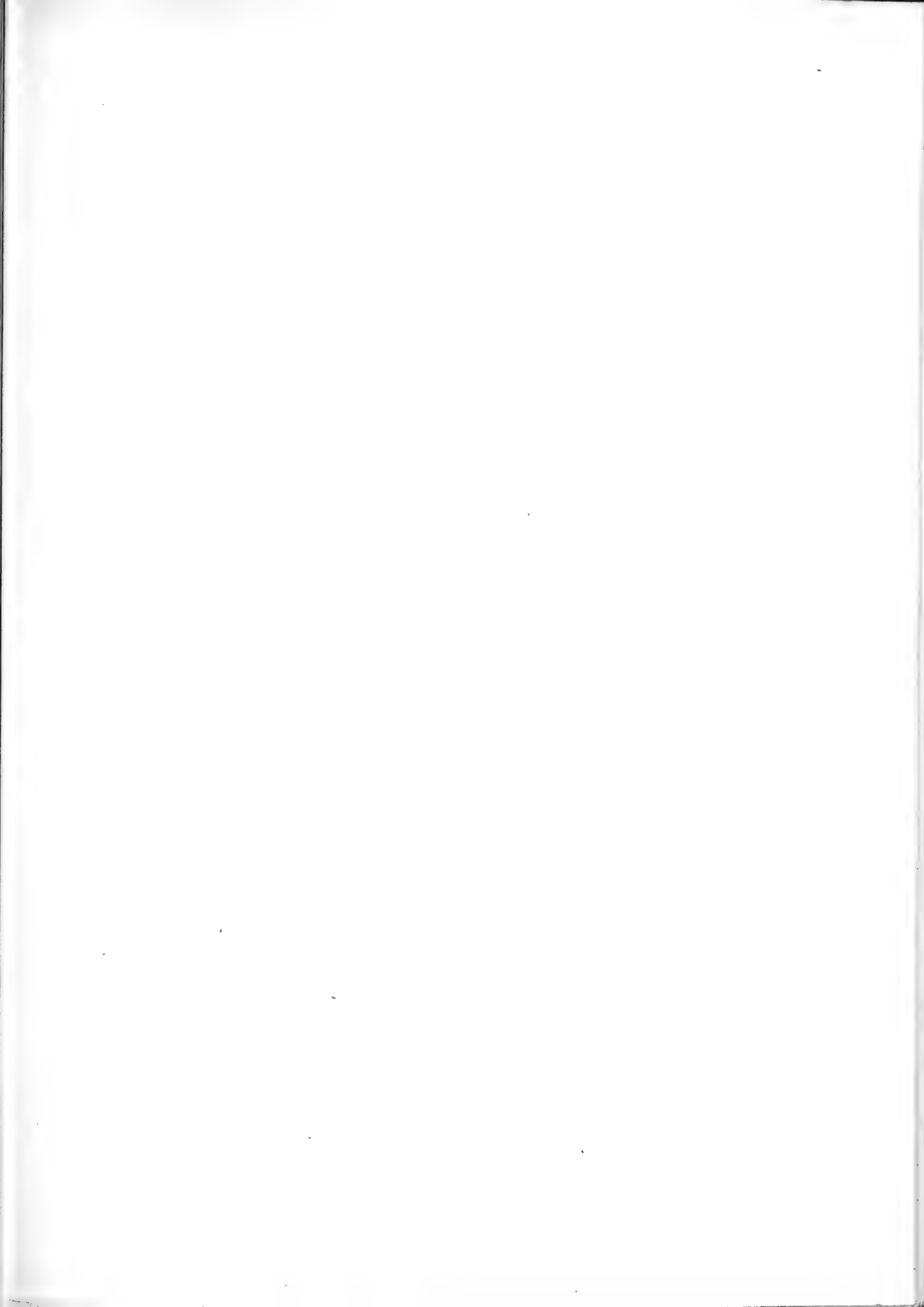
The *J. pulcherrima* of Weber is precisely the same as the Linnæan *ciliaris*; and Mr. Dickson, who published it as a distinct species in the first *Fasciculus* of his *Plantæ Cryptogamicæ*, was afterwards aware of the mistake, and corrected it in the second part of the same work. Nor is the *J. Leersii* of Roth to be considered otherwise than as a synonym to the present plant; for the jointed cilia, which the author dwells so much upon, are no less distinctly apparent in *J. ciliaris*, and even in *J. tomentella*; and Hoffmann's figure of *J. ciliaris*, which is referred to as *J. Leersii*, is an admirable representation of the true *ciliaris*.

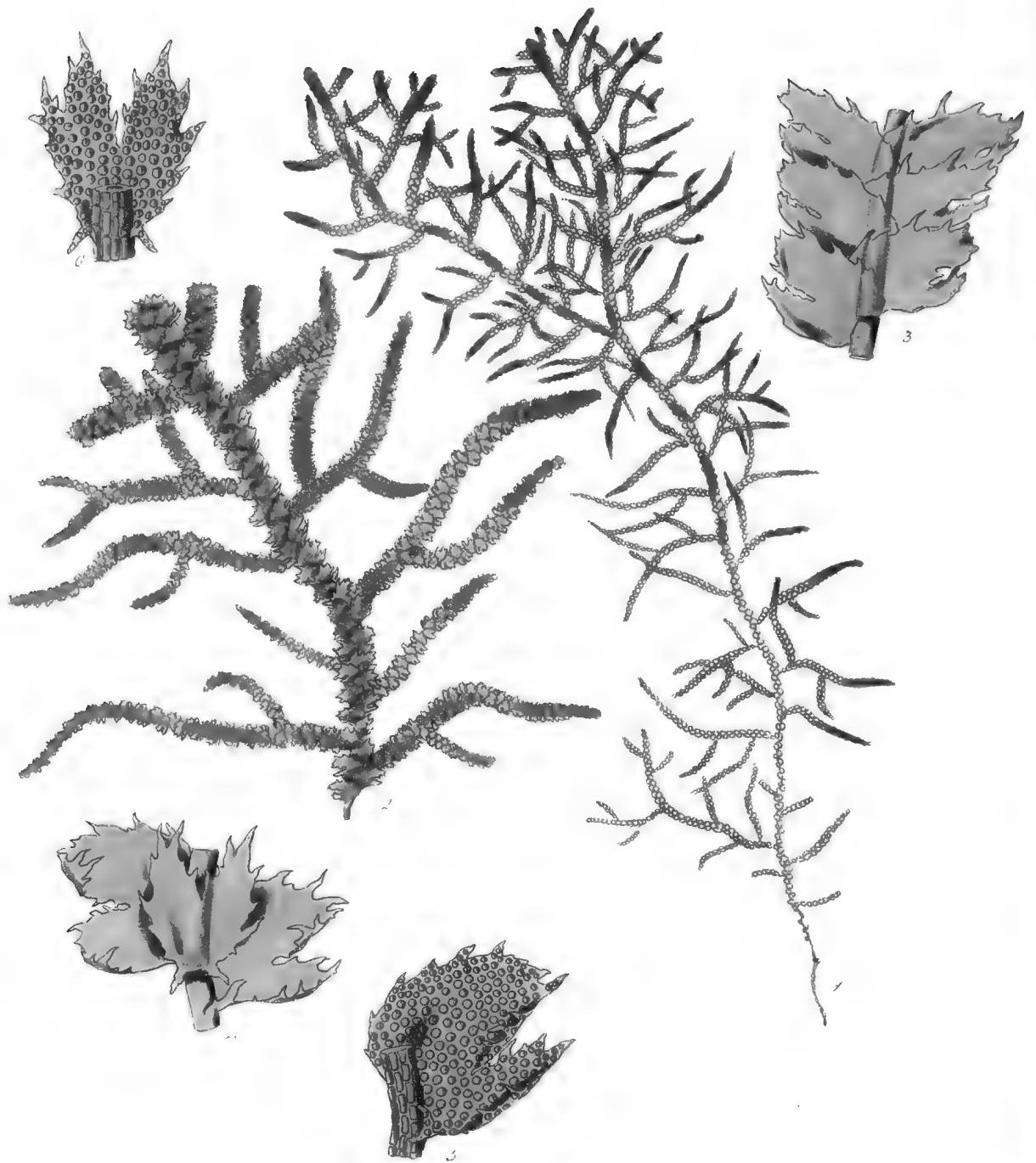
I have already, under my description of *J. tomentella*, pointed out the characters which distinguish that species from the present. The subject of the following plate, *J. Woodsii*, which at first sight bears a considerable resemblance to it, is remarkably different in having the margins of the leaves lacinated, not ciliated; in its bifid stipules; and in the large and distantly-placed cellules of the leaves. Between the three species, there is a considerable natural affinity, and, in all of them, the upper lobe of the leaf is more or less bifid: but the true figure of the leaves and stipules of *J. ciliaris* is admirably described by Wahlenberg, in the following passage, which I am induced to quote, hoping it may tend to remove future doubts upon the subject: "Foliorum lobus supremus seu dorsalis cæteris major est et magis integer; inferiores tam longè fimbriati ut fere multipartiti, ægrè a stipulis discernendi. Stipuli ferè dimidiam longitudinem foliorum æquant, oblongæ, multifido-fimbriatæ: fimbriis longis articulatis."

REFERENCES TO THE PLATE.

FIG.

1. *J. ciliaris*, sterile shoots, natural size.
2. Fertile plants of the same, natural size.
3. Portion of a fertile plant, magnified 6
4. Under side of a portion of the stem, with its leaves and stipule 4
5. Portion of a leaf, to shew the cellules and jointed appearance of the cilia 1
6. Stipule 3
7. Exterior perichæatial leaf 2
8. Interior perichæatial leaf 2
9. Calyx, cut open 4
10. Pistillum 1





Jungermannia Woodsii?
Mosses of the Woods

BRITISH JUNGERMANNIÆ.

(*J. Woodsii.*)

JUNGERMANNIA WOODSII.

(TAB. LXVI.)

JUNGERMANNIA, caule procumbente, bi-tripinnato: foliis bifariam imbricatis, valdè convexis, inæqualitèr bilobis; lobis superioribus bipartitis, spinuloso-dentatis; inferioribus minutissimis, oblongis: stipulis magnis, ovatis, bipartitis, spinuloso-dentatis; basi utrinque calcaratis.

HAB. On the ascent of Mangerton from Cwm na Cappal, Ireland. *Mr. Joseph Woods.*— Since found at the Devil's Punch Bowl, upon the same mountain; and in very great abundance at Brandon, by *Dr. Taylor.*

PLANT growing in large and rather densely-crowded patches.

Stems procumbent, from three to five, and even six inches, in length, considerably stouter in the larger plants than horse-hair, flexuose, filiform, once or twice dichotomous, beset throughout their whole length with rather distantly-placed, patent or recurved, acuminate pinnæ, which vary from an inch to an inch and a half, or more, in length, and are either simple, or again furnished with shorter pinnulæ. The *color* is a dirty brown: the *texture* compact, when dry very brittle.

Leaves (f. f. 4. 5) rather closely placed, from a quarter to half a line in length: in the extreme ramuli the largest are at the apex, in the rest they become gradually smaller towards the apices; every where they are imbricated over the upper surface of the stem and branches, and have a bifarious direction: their form is round or subquadrate, and composed of two very unequal conduplicate lobes, of which the upper one is the largest, convex above, divided, for about half its length, by an acute sinus, into two, ovate segments, which are beset at their margins with variously-sized, but generally large, spiniform teeth: the inferior lobe is exceedingly minute and oblong, with its margin nearly entire. The *cellules* of the leaf are of a roundish form, very distantly placed, resembling those of *J. Turneri*. The *color* is a purplish brown, paler, and of a more dirty hue in the lower leaves.

(*J. Woodsii*.)

BRITISH JUNGERMANNIÆ.

Stipules very large, considerably broader than the stem, widely ovate, cleft into two spinuloso-dentate segments, and, at the angles of the base, furnished with a reflexed tooth or spur (f. 6).

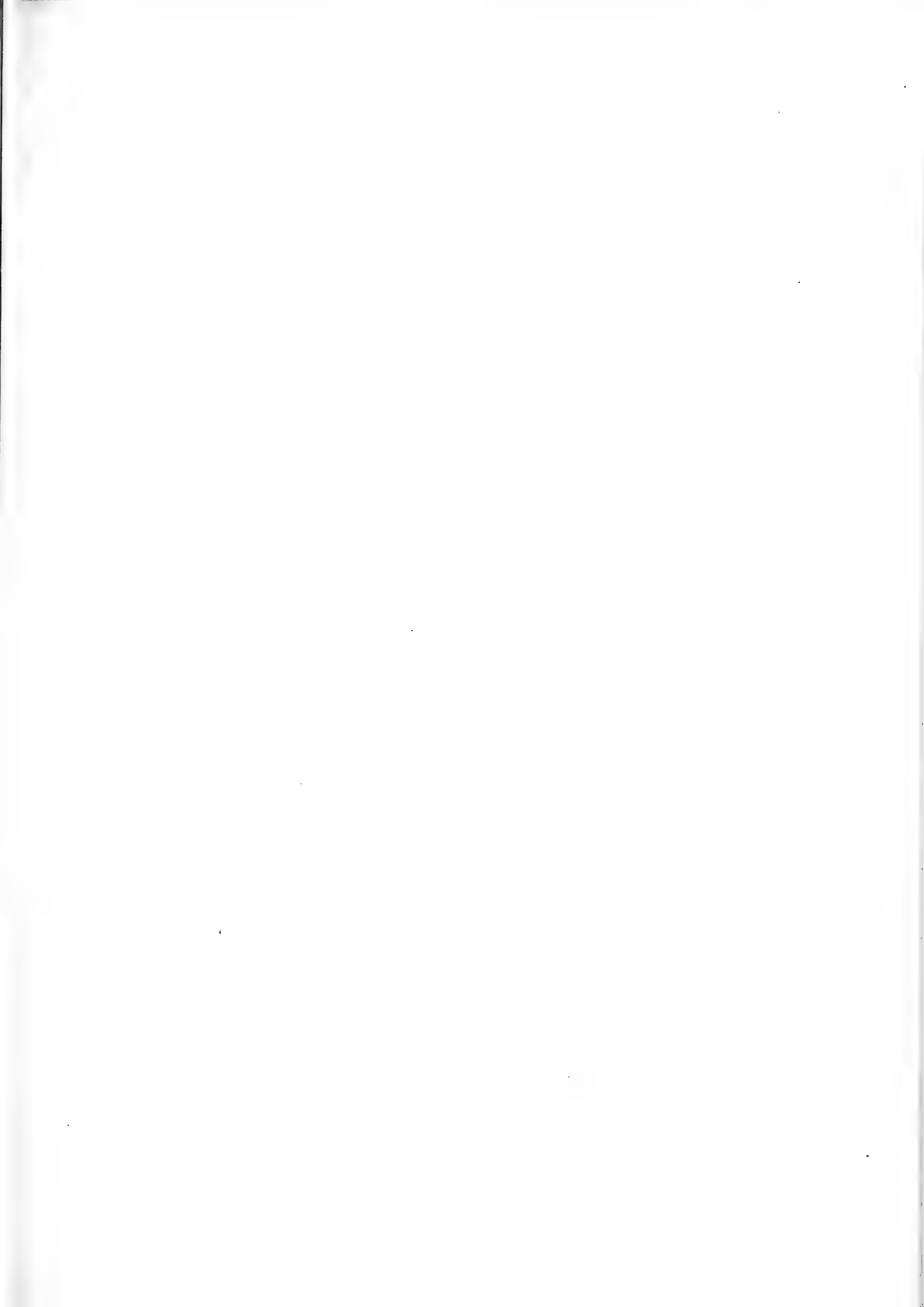
NO FRUCTIFICATION, either MALE or FEMALE, has yet been discovered.

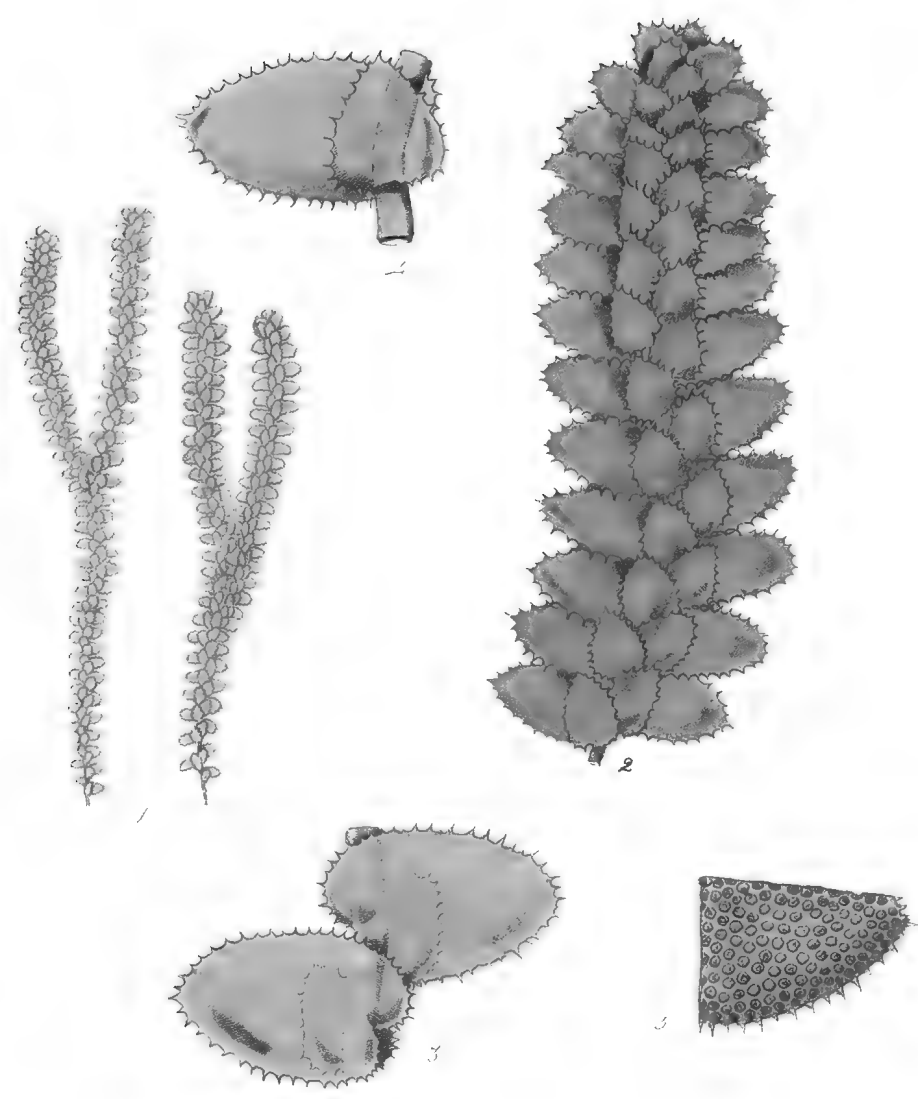
The truly magnificent species represented in the annexed plate, was detected in Ireland, in the year 1809, by my friend, Mr. Joseph Woods, to whose name I am desirous of dedicating it. It has since been found by Dr. Taylor, in the same country, and may possibly have been overlooked by other naturalists, for a variety of *J. ciliaris*, from which it differs in the size and ramification, as well as in the border of the leaves and stipules, in the extremely minute lobule of the former of these, and in the large size and very deep sinus of the latter. A farther and equally important mark of discrimination will be seen in the structure of the leaves; for the cellules in *J. ciliaris* are so closely situated, and the interstices consequently so narrow, that a beautifully reticulated appearance is afforded by them; whereas those of *J. Woodsii* are widely placed, and at very unequal intervals, in the same manner as those of *J. juniperina*, *J. Taylori*, *J. Turneri*, and a few others.

REFERENCES TO THE PLATE.

FIG.

- | | |
|----------------------------------------------------------------------------|---|
| 1. <i>J. Woodsii</i> , natural size. | |
| 2. Extremity of the same, magnified | 6 |
| 3. Portion of a stem, with its leaves, seen on the upper side..... | 4 |
| 4. Under side of a portion of the stem, with its leaves and stipules | 3 |
| 5. Portion of the leaf, to exhibit the cellules | 1 |
| 6. Stipule | 1 |
-





Jungermannia planifolia?
Silene cristata etc. etc.

JUNGERMANNIA PLANIFOLIA.

(TAB. LXVII.)

JUNGERMANNIA, caule erecto, subsimplice: foliis quadrifariam imbricatis, compresso-planis; inferioribus majoribus, ovatis; superioribus cordatis; omnibus elegantissimè dentato-ciliatis.

HAB. Upon Ben na Bord; and upon Ben Mac Davie, a mountain to the north of the Dee.
Mr. George Donn, 1812.—Summit of Brandon. *Dr. Taylor*, 1813.

PLANT growing in rather closely-crowded patches of a remarkably dingy brown color; always intermixed with mosses and other Jungermanniæ.

Roots, a few short brownish fibres, issuing principally from the lower part of the plant.

Stems erect, from two to three inches long, and about the thickness of packthread, flexuose, filiform, for the most part simple, but now and then forked: their color dark brown: their texture compact, rigid, and brittle.

Leaves (f. 2) truly quadrifarious in their insertion, and imbricated on both sides of the stem; those at the back of it the largest, a line in length, plane, distichous, vertical, of a widely ovate figure; the superior leaves scarcely half so large as the rest, and obliquely appressed to them; their form nearly cordate: the whole are beautifully dentato-ciliate at their margins, of a rather dark brown color, sometimes inclining to purple towards the extremity. The *cellules* (f. 5) are very minute, but somewhat distantly placed, and frequently of a paler color than the interstices: the texture thin, membranaceous; when dry, brittle, like the stem.

FRUCTIFICATION totally unknown.

(*J. planifolia*.)

BRITISH JUNGERMANNIÆ.

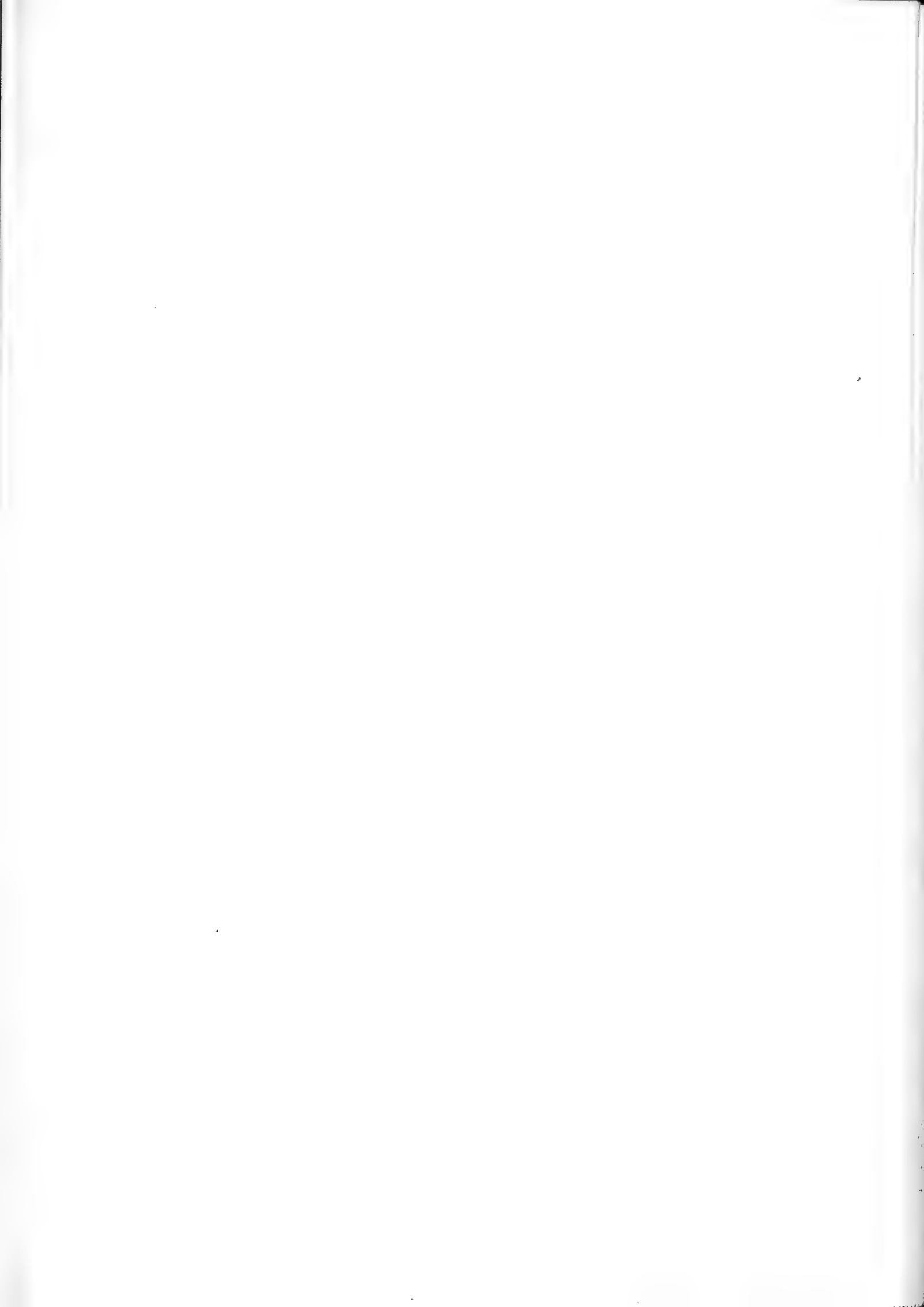
The remarkable insertion and direction of the leaves so well distinguish the present from every known British species of *Jungermannia*, that it would be superfluous to say any thing more upon the subject, were it not for the great similarity which it bears at first sight to *J. nemorosa*. My acute friend, Dr. Taylor, first pointed out to me the real structure of the leaves, and ascertained them to be totally different from those of the species that belong to the section of the genus, "*foliis inæqualitèr bilobis*," the apparent lobe and lobule being in reality distinct leaves, as well in regard to their insertion, as to their figure; and in both respects bearing no inconsiderable resemblance to the *Hookeria quadrifaria* of Dr. Smith.

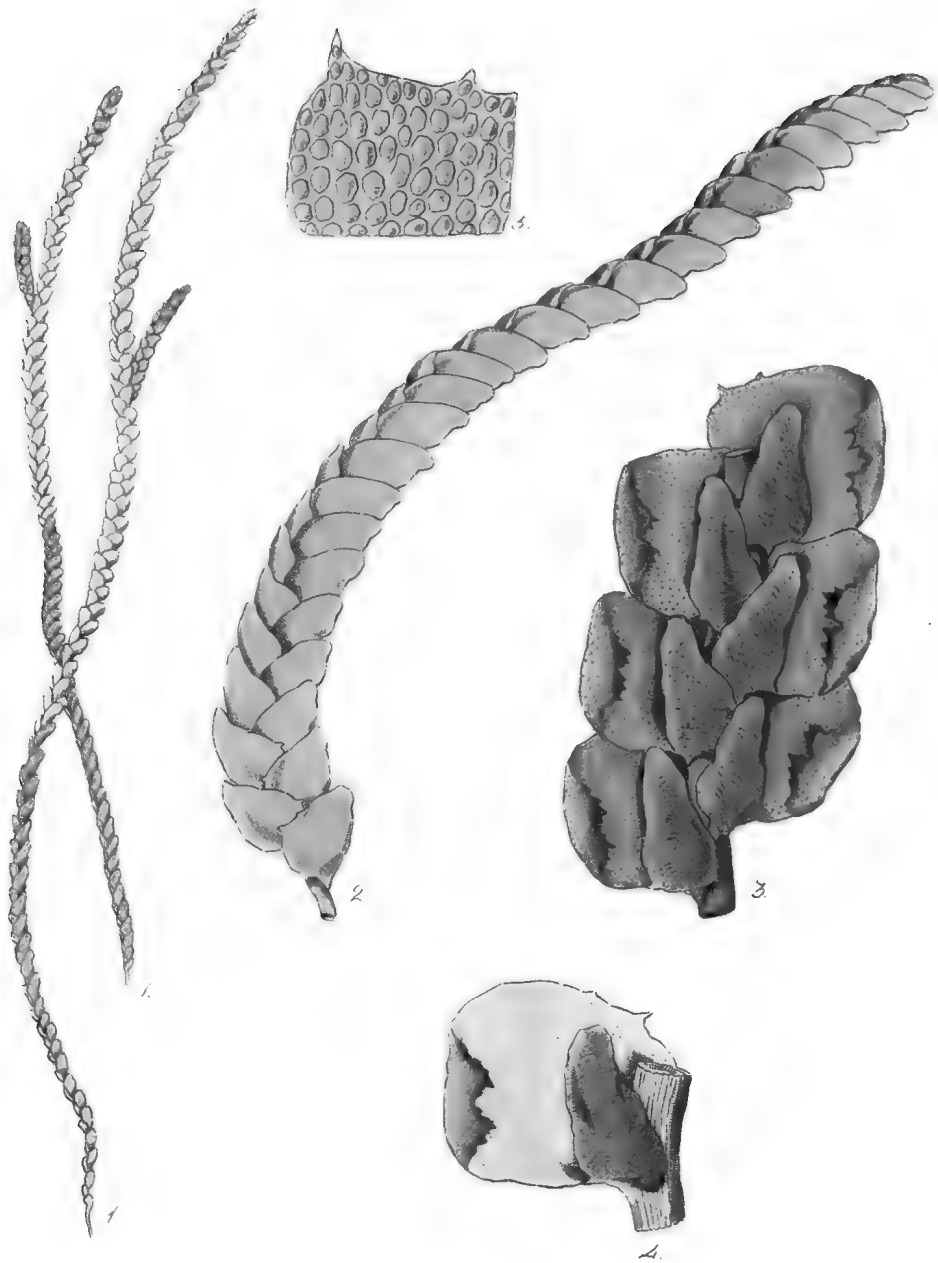
Mr. Donn first discovered this species, intermixed with *J. Donniana*.

REFERENCES TO THE PLATE.

FIG.

- | | |
|-------------------------------------------------------------|---|
| 1. <i>J. planifolia</i> , natural size. | |
| 2. Portion of the same, magnified | 6 |
| 3. Posterior view of a portion of the stem and leaves | 4 |
| 4. Anterior view of a portion of the stem and leaves | 4 |
| 5. Portion of the leaf | 1 |





Jungermannia cochleariformis.
Geacria peruviana (Lamour.)

BRITISH JUNGERMANNIÆ.

(*J. cochleariformis*.)

JUNGERMANNIA COCHLEARIFORMIS.

(TAB. LXVIII.)

JUNGERMANNIA, caule procumbente, subsimplice: foliis arcuè imbricatis, convexis, ovato-rotundatis; apice bifidis serratisque; basi subtùs auriculatà; auriculà magnà, oblongà, ovatà, inflatà.

Jungermannia cochleariformis. WEIS, *Pl. Crypt.* p. 123. WEBER, *Spic. Fl. Goet.* p. 145.

ROTH, *Germ.* III. p. 399. SWARTZ, in *Act. Nov. Ups.* IV. p. 241. LINN, *Syst. Nat.* ed Gmel. II. p. 1350. *Engl Bot.* t. 2500.

Jungermannia purpurea. SCOPOLI, *Carn.* II. p. 347. LIGHTF. *Scot.* II. p. 773.

Mnium Jungermannia. LINN. *Sp. Pl.* p. 1579. *Syst. Nat.* II. p. 701. HUDS. *Angl.* p. 473.

Lichenastrum Trichomanis facie, prælongum foliis concavis unam partem spectantibus.

RAII *Syn.* p. 112.

Lichenastrum alpinum purpureum, foliis auritis cochleariformibus. DILL. *Musc.* t. 69.

f. 1. C. D. E.

Jungermannia foliis amplexicaulibus subrotundis. HALL. *Helv.* III. p. 58?

HAB. Mountainous bogs in Ireland, and the north of Scotland, not uncommon.—It is particularly abundant about Cape Wrath, in the north-western extremity of the county of Sutherland, mixed with *Arbutus alpina*.

PLANT growing in large, but loosely-entangled patches of many inches in diameter.

Stems, in their natural state, procumbent, but, when the plants grow thickly crowded or intermingled with tall mosses, not unfrequently erect: in length, they vary from four to six inches, and are about as thick as common packthread, flexuose, simple, or here and there beset with a small undivided innovation, which, for the most part, occurs towards the extremity. The *color* is a yellowish brown; the *texture* rigid, and brittle when dry.

Leaves very closely placed, and imbricated alternately, and with much regularity over the whole upper surface of the stem, so that they altogether conceal it: they are remarkably convex, distichous, with their apices incurved and looking one way (f. 3), as do the whole of the leaves occasionally in the fresh plant, and always in the dried ones, in which state the points of the leaves meet each other, and cover the auricles: the figure of the leaves is round, or approaching to ovate; at the upper margin, near its insertion upon the

(*J. cochleariformis*.)

BRITISH JUNGERMANNIÆ.

stem, furnished with one or two rather large and spiniform processes or teeth, and, at the extremity, divided by an acute sinus into two serrated lobes. At the lower base of the leaf, and on the under side of the stem, is the *auricle*, an ovate, inflated, pouchlike appendage, about one-fourth of the size of the leaf, which it exactly resembles in texture; both having extremely minute, yet distantly-placed, cellules (f. 5). The *color* of the leaves is a fine purple towards the extremity of the plant, but becoming browner as it approaches the base; that of the auricles a greenish brown.

The FRUCTIFICATION is altogether unknown to me.

The Linnæan *Mnium Jungermannia* is, in all probability, the same as the plant here represented, which has, nevertheless, no affinity with the plant referred to in Micheli's *Nova Genera Plantarum*, by the illustrious Swede, under that species; that, as I have already had occasion to observe, being nothing more than a purple variety of *J. nemorosa*. Ray's plant is surely the same as ours; and Dillenius' figure is too accurate to be mistaken, although I did not observe the species in his herbarium at Oxford. The Hallerian synonym I can quote but doubtfully; but Weis, who first adopted the name of "*cochleariformis*," has described the species with considerable accuracy. Neither this, however, nor any other author, seems to have been acquainted with the fructification; unless, indeed, Weber may be supposed to have been so, who still merely says of the plant, that "*Maii mense profert vaginas terminales, surculis concolores, cylindricas.*"

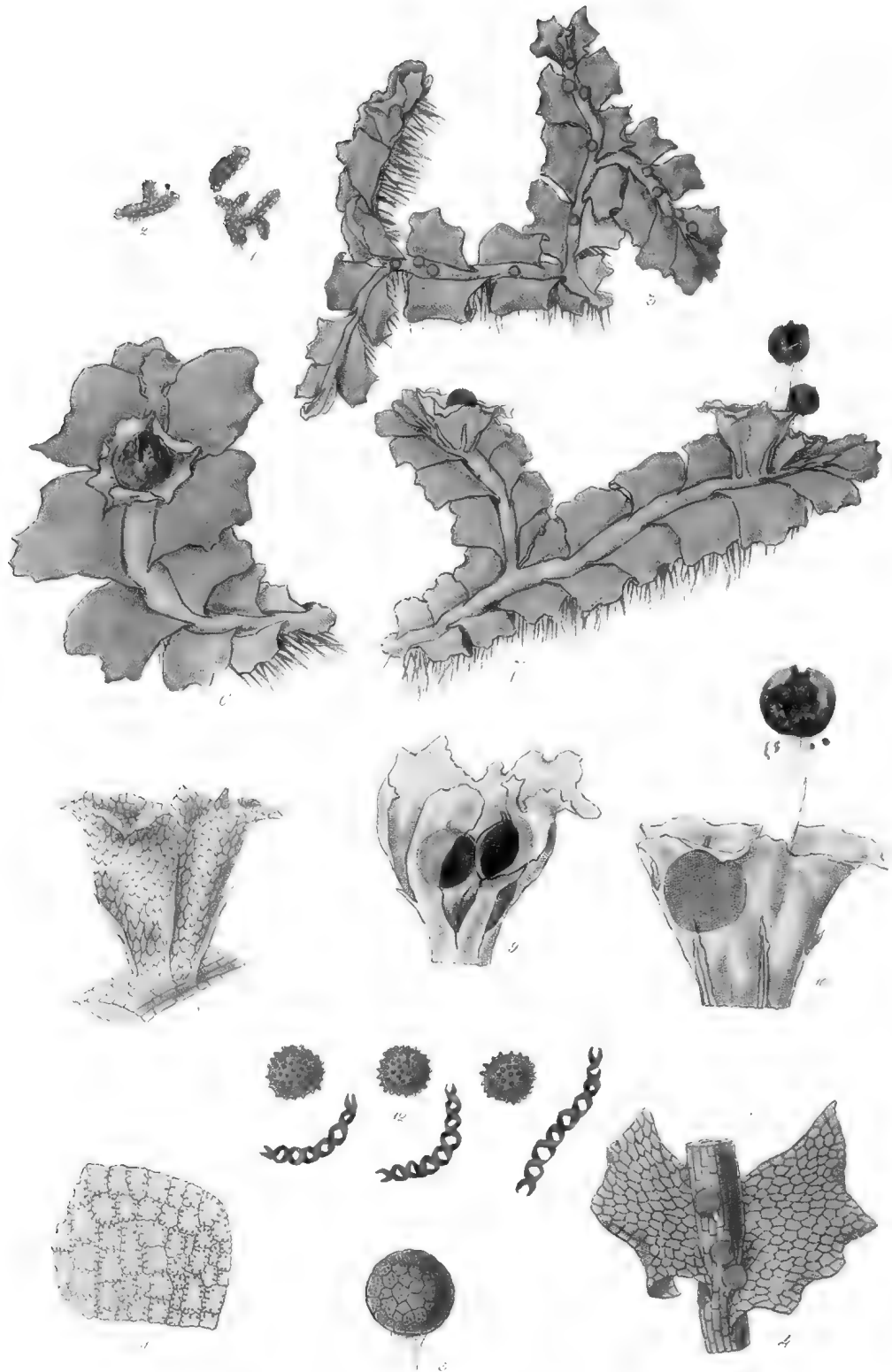
Dr. Smith has made a remark upon *J. cochleariformis*, which I have not been able to verify by my own observation, that "the younger plants have flatter leaves, and are without the auricles." On the contrary, in all the specimens that have fallen under my observation, the leaves have been very convex, and the auricles sufficiently conspicuous.

REFERENCES TO THE PLATE.

FIG.

- | | | |
|----|------------------------------------------------------|---|
| 1. | <i>J. cochleariformis</i> , natural size. | |
| 2. | Portion, magnified | 6 |
| 3. | Under side of a portion of the stem and leaves | 4 |
| 4. | Leaf and auricle | 3 |
| 5. | Portion of a leaf | 1 |
-





Fungermannia pusilla ?
Fossembrenia pusilla L. var.

BRITISH JUNGERMANNIÆ.

(*J. pusilla*.)

JUNGERMANNIA PUSILLA.

(TAB. LXIX.)

JUNGERMANNIA, caule procumbente, subsimplici: foliis horizontalibus, quadratis, undulatis, obtusè crenatis: fructu terminali; calycibus campanulatis.

- Jungermannia pusilla*. LINN. *Sp. Pl.* p. 1602. *Syst. Nat.* II. p. 707. *Fl. Suec.* p. 404. WEIS, *Crypt.* p. 117. WEBER, *Spicil. Fl. Goet.* p. 161. POLLICH, *Palat.* III. p. 203. OEDER, *Enum. Pl. Fl. Dan.* p. 43. HEDWIG, *Th.* p. 86. t. 18. f. 89—92. SCHMIDEL, *Icones*, p. 82. t. 22. LAMARCK, *Encycl. Bot.* III. p. 284. HOFFMANN, *Germ.* II. p. 90. ROTH, *Germ.* III. p. 383. SCHRADER, *Spicil.* p. 107. LAMARCK, *Fl. Fr. ed. 2.* II. p. 429. RELHAN, *Cant.* p. 440. HUDS. *Angl.* p. 518. *Engl. Bot.* XXV. t. 1175. *Fl. Gall.* p. 92. WEBER et MOHR, *Fl. Crypt. Germ.* p. 429. SCHWAEGR. *Hist. Musc. Hepat. Prodr.* p. 29.
- Jungermannia angulosa*. DICKS. *Plant. Crypt. Fasc. I.* p. 7. WITH. *ed. 4.* III. p. 355. LINN. *Syst. Nat. ed. Gmel.* II. p. 1348. LAMARCK, *Encycl.* III. p. 280.
- Jungermannia pygmæa*. WULF. in *Schr. Berl. Naturf.* 8. I. p. 151, 152. (*vide* MOHRIL.)
- Lichenastrum minimum*, capitulis nigris, lucidis. RAII *Syn.* p. 310.
- Jungermannia foliis latiusculis obtusis undulatis, et veluti angulosis*. MICHELI, *Nov. Gen. Pl.* p. 7. t. 5. f. 10.
- Lichenastrum pinnulis obtusè trifidis, nervo geniculato*. DILL. *Musc.* t. 71. f. 22. C. D. E.
- Lichenastrum exiguum*, capitulis nigris lucidis, e cotylis parvis nascentibus. DILL. *Musc.* t. 74. f. 46.

HAB. Moist, shady banks, especially on a clayey soil, where it is not of unfrequent occurrence; bearing its fructification from October to the end of the spring.

The **PLANT** grows either in detached individuals, or thickly matted together so as to form patches of many inches in diameter, and firmly adhering to the ground by its

Roots, which are long, dense, simple, issuing from the whole length of the under side of the stem, and of a remarkably deep purple color.

(*J. pusilla*.)

BRITISH JUNGERMANNIÆ.

Stems wholly procumbent, lying flat upon the ground, varying from one to three, or sometimes four lines, in length; the diameter thick in proportion to the size of the plant, cylindrical, or somewhat compressed, waved, simple (f. 6), beset with a single ramulus (f. 7), or, more rarely, divided once or twice in a dichotomous manner.

Leaves varying in number, according to the size of the individual, about half a line long, closely placed, obliquely decurrent, horizontal, of a squarish figure, much waved, but scarcely plicate, the extremity cut into two, three, or four irregular and obtuse notches, forming segments, which are sometimes blunt and sometimes acute. Their color is a pale green, with more or less of a yellowish brown tinge as they approach the base of the stem; sometimes, according to Schmidel, partaking of a reddish hue. The *cellules* are roundish, approaching to ovate (f. 4).

There are neither *perigonial* nor *perichæatial leaves** to this species.

The MALE FRUCTIFICATION (f. f. 3. 4) is scattered about the upper surface of the stem, and quite exposed, both upon sterile and upon capsuliferous plants: Each

Anther is of a spherical form, reticulated, of a yellow color, terminating a white, pellucid, footstalk, which scarcely exceeds it in length (f. 5).

FEMALE FRUCTIFICATION originating from the centre, or towards the extremity of the plant; but I have never observed it to be exactly terminal, although Dr. Roth considers that to be its true situation, and is of opinion that, when it is lateral, it arises from an "*innovatio caulis*."

Calyx produced singly, or two or three together, large, three-fourths of a line in length, sometimes nearly equalling the whole size of the plant, campanulate, having a cleft in the margin (f. 10), and the border variously crenate and waved. At the base are five minute subulate stipuliform processes, which have been hitherto unobserved by botanists, but which I find very constant in all the individuals I have examined. Sometimes the calyx is cut into three or four unequal segments, as is represented at figure 9. In the reticulation it resembles the leaves, as well as in texture, except that it is somewhat more delicate. Its color is, moreover, paler, and not unfrequently, according to the acute Schmidel, of a reddish or pinky cast.

Germen of an obovate form: two or three are sometimes contained in the same calyx (f. f. 9. 10. and 7).

Calyptra whitish, delicate, reticulated, terminated by a short style.

Peduncle scarcely twice the length of the calyx, of a silvery white, succulent, cellulose, sometimes a little twisted (f. 10).

Capsule exactly spherical, of a reddish brown color, and of a thin, delicate, semipellucid nature, reticulated, having deep brown dots along the margins of the reticulations (f. 11); departing from the essential character of the genus, inasmuch, as it bursts in a most irregular manner†, to permit the discharge of the seeds, as may be seen at figures 10. 6. and 7.

* Yet Roth says of the fructification, that it is "*cincta basi foliis quatuor laxis*."

† Schmidel, I ought in justice to observe, expressly says, "*valvæ recentèr dehiscentes oblongè ovatæ et acutæ sunt, diu autem hanc formam non retinent, sed ob teneritatem ab apice marcescere et per particulas cadere incipiunt*:" and his fig. 17 represents the four entire valves: yet, in the specimens which have come under my own observation, the capsules have, as shewn in the plate, burst irregularly.

BRITISH JUNGERMANNIÆ.

(*J. pusilla.*)

Seeds spherical, numerous, of a rich brown color, rough, and with prominent points or tubercles. The *spiral filaments* are short, composed of a double *helix*. A few of them remain, Schmidel says, after the dispersion of the seeds, attached to the bottom of the capsule in the form of a tuft or pencil.

What the "*semina*" may be, "*in racemos disposita per ramulorum longitudinem*," figured and described by Micheli on this species, I am at a loss to determine. The conjecture of Schmidel is probably just, that they are some parasitic fungus, and of Mohr, that they may be some species either of *Monilia* or *Botrys*. The curious bodies, which Schmidel himself has taken for the male fructification of this species, have unhappily, altogether, escaped my notice; but his description is worthy of attention, and I shall offer no apology for the length of the following extract, though I cannot help expressing my regret at being unable to throw any additional light upon the subject: "*Inter supremam pinnam*," he says, "*aut eam quæ incompleta est, aliquot aciculæ occurrere solent absque involuero, sed plerumque aliquâ calicis specie instructi sunt. Ex medio enim caule, minutæ, tenerrimæ, vesiculares et lætè virides surgunt lacinulæ, quæ globulorum latera modò muniunt, modò cingunt, et plerumque cum globulis ipsis rursùs evanescunt, uno alterove forte diutius restante. Superficies globulorum externa tuberculis incerti numeri, decem aut pluribus, aliquantùm pellucidis inæqualis est, et paries totus ex vesiculis minutissimis rotundis conflatur, quas lens summè augens demùm detegit. Discissi globuli vesiculas succum crocei coloris satis copiosum includentes promunt, neque solidi quid, seminis alicujus genium aut formam monstrans possident, adeoque eo respectu satis declarant, quòd organi masculini et Antherarum vices expleant.*" It will, however, at once be seen that these supposed "*Organi masculini*" are very different from the Anthers in the annexed plate, which, in every respect, resemble those in other species of the genus, and differ in nothing from what are represented by Hedwig, except in color; and this, probably, varies in different stages of their existence.

With regard to the affinities of this species, I know of none to which it is at all naturally allied; and, indeed, its extremely delicate capsule, and the manner in which it bursts, are almost sufficient to afford characters for its separation from the rest of the genus, did not the habit of the plant forbid it. In the calyx, two remarkable peculiarities may be observed, in the widely-expanded mouth, and the stipulaceous processes, or the bracteæ, as they might be called, at the base. The situation, too, of the fructification is very curious, unaccompanied by perigonal or perichæatial leaves; and the whole plant diffuses an agreeable odor, not unlike that of the sweet sedge, *Acorus Calamus*.

The crisped leaves of this plant suggested to Schmidel the idea that it resembled a lettuce; for he says, "*gregatim nascitur et propiùs inspecta minutos lactucæ cæspites imitatur, quibus etiam Michelius adsimilavit*;" and Roth, considering that this appearance was peculiar to the young plants, observes, "*Planta pusilla, in juniore ætate cæspitem minutulum, lætè viridem, crispum et, ut bene monet Michelius, lactucæ cæspiti æmulum representat; proveciore ætate sese magis extendunt frondes et evolvuntur.*"

(*J. pusilla*.)

BRITISH JUNGERMANNIÆ.

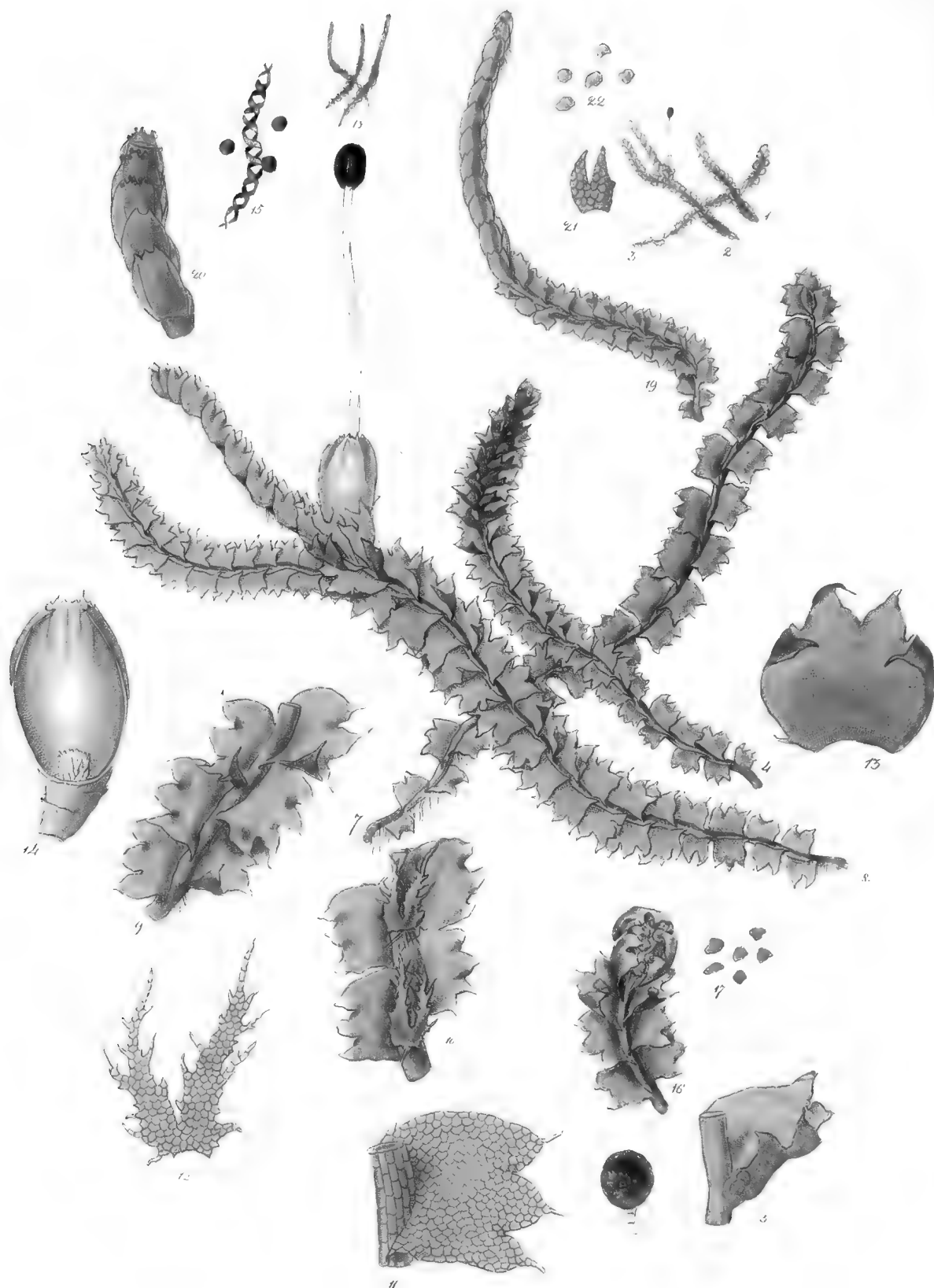
In my *Tour in Iceland*, ed. 2, i. p. 161, I have mentioned having found this plant in a most flourishing state, although always exposed to the vapor of boiling water. Indeed, it was the only spot in that island where I recollect to have seen it; nor does it appear, from Wahlenberg's *Flora Lapponica*, that it is at all a native of that country. In the warmer parts of France and Switzerland, and in the north of Italy, it is far more common than in England.

REFERENCES TO THE PLATE.

FIG.

1, 2. Male and female plants, natural size.	
3. Male plant, magnified	6
4. Portion of a male plant, with its anthers	2
5. Anther	1
6. Female plant, with one calyx	6
7. Female plant, with two calyces	6
8. Calyx	3
9. Calyx, cut into segments	3
10. Calyx, with capsule bursting	3
11. Portion of the capsule	1
12. Seeds and spiral filaments	1





Fungermannia barbata ?

Leaves small, green, 1/2 in.

JUNGERMANNIA BARBATA.

(TAB. LXX.)

JUNGERMANNIA, caule procumbente, simpliciusculo: foliis rotundato-quadratis, 3 vel 4-fidis; stipulis lanceolatis, acutè bifidis, margine laciniatis: fructu terminali; calycibus ovatis, ore contracto, dentato.

- Jungermannia barbata.* SCHREBER, *Spicil. Fl. Lips.* p. 107. SCHMIDEL, *Icones.* p. 187. *Dissert. de Jung. Char.* p. 20. SCHRADER, *Samml.* II. p. 5. *Spicil. Fl. Germ.* p. 74. HOFFM. *Germ.* II. p. 89. ROTH, *Germ.* III. p. 382. LINN. *Syst. Nat.* ed. Gmel. II. p. 1360. LAMARCK, *Fl. Fr.* ed. 2. II. p. 29. *Fl. Gall.* p. 92.
- Jungermannia quinquedentata.* HUDS. *Angl.* p. 511. LINN. *Sp. Pl.* II. p. 1598. *Syst. Nat.* II. p. 705. SCHRANK, *Bavar.* II. p. 496. POLLICH, *Pal.* III. p. 185. *Enum. Pl. Fl. Dan.* p. 41. LEERS, *Herb.* p. 250. VILLARS, *Delph.* III. p. 924. WEBER, *Spicil. Fl. Goet.* p. 137. ROTH, *Germ.* III. p. 383. WITH. ed. 4. III. p. 853. LINN. *Syst. Nat.* ed. Gmel. II. p. 1349. LIGHTF. *Scot.* II. p. 775. LAMARCK, *Encycl. Bot.* III. p. 280. *Engl. Bot.* t. 2517. WEBER et MOHR, *Fl. Crypt. Germ.* p. 430. SCHWABGR, *Hist. Musc. Hepat. Prodr.* p. 29. WAHL. *Fl. Lapp.* p. 395.
- Jungermannia Flörkii.* WEBER et MOHR, *Fl. Crypt. Germ.* p. 410. WAHL. *Fl. Lapp.* p. 389. *Est, fide MOHRII,*
- Jungermannia dichotoma.* SCHLEICH. *Cent.* 3. n. 57; *et*
- Jungermannia gracilis.* EJ. *Cent.* 3. n. 60.
- Jungermannia tridentata.* SCOP. *Carn.*
- Jungermannia quadridenta.* WULF. in SCHR. *Berl. Naturf.* 8. 1. p. 154.
- Lichenastrum Trichomanis facie, foliolis multifidis, capitulis e summis ramulis nascentibus.* RAII *Syn.* p. 113.
- Jungermannia alpina, foliis subrotundis, latiusculis, angulosis.* MICHELI, *Nov. Gen.* p. 8. t. 5. f. 11.
- Lichenastrum pinnulis obtusè trifidis, nervo geniculato.* DILL. *Musc.* t. 71. f. 22.
- Lichenastrum multifidum majus, ab extremitate florens.* DILL. *Musc.* t. 71. f. 23.

β. MINOR; caule supernè elongato, adscendente: foliis inferioribus patulis; superioribus arctissimè imbricatis, gemmiferis.

(*J. barbata*.)

BRITISH JUNGERMANNIÆ.

HAB. Subalpine countries upon rocks, in woods and heathy places, abundant.—*Var. β* was discovered by the *Rev. R. B. Francis*, growing among *Dicranum glaucum*, in Holt wood, and has since been found by *Miss Hutchins* so imbedded among mosses and tufts of *J. nemorosa*, that only the tops of the shoots appear. *Dr. Taylor* likewise finds it near Dublin, and *Mr. Lyell* at Kinnordy.—(The *male fructification* exists throughout the year: the *female*, which is far less common, is produced in the spring months).

PLANT growing in more or less densely-crowded patches, and of various dimensions.

Roots abundant, and often clothing the whole under side of the stem, consisting of minute, simple, brownish fibres.

Stems from one to two, or three inches long, never, I believe, really branched, but here and there producing simple innovations, which have sometimes the appearance of divided stems; flexuose, filiform, cellulose, of a greenish color, inclining to brown in older specimens.

Leaves varying much in the closeness of their position: sometimes they are densely imbricated; at other times, distantly placed; half a line long, distichous, alternate, patent or erect, of a subquadrate figure, slightly decurrent at the base, at the extremity divided into generally three, but sometimes only two, or often four, large, triangular teeth; not always, indeed, of equal sizes, for the inferior one (which is nearest the base of the plant) is usually the smallest, and frequently incurved, or even conduplicate, while the rest are expanded: they are entire, mostly acute and diaphanous at the apex (f. 9); sometimes acuminate, or even spiniform, and sometimes, especially in the *var. β*, obtuse. Besides these large teeth or segments, there is a very minute one situated at the base of the upper margin of the leaf, near its insertion on the stem (f. f. 10. 11. 13). The color, too, is remarkably variable, depending much on the more or less exposed place of growth of the individuals. Most usually it is a pale, sometimes a bluish, green. In *var. β*, brownish. The *cellules* (f. 11) are somewhat of a roundish form.

Of the *stipules* there is one to each pair of leaves, which varies considerably in size upon different specimens. It is always of a widely lanceolate figure, divided for more than three-fourths of the way into two narrow acuminate segments, which, on their margins, are again cut into variously-sized teeth or laciniae. In *texture* and *color* it resembles the leaves.

The *perigonal leaves* (f. f. 4. 6) are crowded together at the extremity of a stem, and scarcely differ from the common cauline ones, except in being more convex, and in having a swollen or ventricose base.

Of the *perichæatial ones*, three or four surround the base of the calyx: their figure is subrotund, concave in the inside, at the apex quadrifid, with the segments very sharp; near the base, on one side, is a small spiniform tooth (f. 13).

MALE FRUCTIFICATION in the axillæ of the perigonal leaves:

Anthers of an ovato-spherical form, of a greyish color, slightly reticulate. *Footstalk* short, whitish, cellulose.

FEMALE FRUCTIFICATION terminal, but frequently appearing lateral from the “*innovatio caulis*” just beyond it.

The *calyx*, before it has acquired the length of the perichæatial leaves, is nearly spherical, then ovate, or rather obovate (f. 8), plicated upward; the *mouth* contracted, and sharply, but irregularly, toothed.

BRITISH JUNGERMANNIÆ.

(*J. barbata*.)

Calyptra ovate, delicate, reticulated, and tipped with a short tubular style.

Pistilla numerous, lanceolate, a little swollen at the base, and slightly expanded at the mouth.

Peduncle from three-fourths of an inch to one inch in length, white, succulent, cellulose.

Capsule dark brown, ovate, approaching to spherical, opening into four, or sometimes, according to Schmidel, three valves.

Seeds and *spiral filaments* deep fulvous brown: the former spherical; the latter formed of a double *Helix*.

Gemmæ are produced both on the common appearance of the plant, and more abundantly on the *var. β*. On the former, I have always observed them to be collected into small spherules (f. 16): in the latter, to be loosely scattered at the apices of the leaves. In both, they are of a roundish figure, beset with sharp angles, of a greenish brown color, semipellucid.

My *var. β* (f. 18) is considerably smaller than *α*, rarely exceeding an inch in length, notwithstanding that the upper half is usually lengthened and ascendant. This part is covered with *leaves* so closely imbricated on each side of the stem, and appressed to it, as to conceal it altogether, and make it bear no inconsiderable resemblance to the shoots of *J. consinnata*: while the lower leaves are patent, as in the common state of the plant. The *leaves*, however, throughout, are more concave, and the color much browner. The uppermost leaves are notched, forming three, and sometimes only two, small teeth (f. f. 19. 20). On these the *Gemmæ* are situated. The *leaves* below them are frequently antheriferous. So small are the *stipules*, that they are with difficulty discoverable; and they will be found to be rather ovate than lanceolate, whilst the margins are nearly intire. Unfortunately, no FEMALE FRUCTIFICATION has been yet met with, by which it might be ascertained how far I have done right in making the present plant a variety of *J. barbata*, for it differs in many particulars; and I am not aware, that the common appearance of this species has ever been found in our flat parts of England; it being confined, as I have reason to think, to somewhat mountainous districts.

Notwithstanding that the figure 23, t. 71, of Dillenius has been generally quoted as the *J. tribolata*, it is really intended, as well as figure 22 of the same plate, for the plant here described, if any dependance can be put in the specimens corresponding with those numbers in the Herbarium at Oxford. Micheli's representation of this species is particularly unsatisfactory: that of Schimdel, in his *Icones*, as well as his elaborate description, are truly from the hands of a master, although he has fallen into the same error in common with the other botanists who have described this plant, all of whom, with the exception of Dillenius, have omitted to notice the stipules. I am much surprised that they should have escaped the acute researches of Wahlenberg and Mohr. These naturalists have, it is true, discovered them on what I consider to be the same species, the *J. Flörkii*; for nothing can better correspond with our present species than the description of it in the *Flora Cryptogamica Germaniæ*: "Foliis inæqualiter tridentatis, cæterum integerrimis: amphigastriis (*our stipules*) 2-partitis, laciniis subpinnatifidis." Yet, although Wahlenberg refers to Mohr's description, he has represented the plant as having simple stipules,

(*J. barbata*.)

BRITISH JUNGERMANNIÆ.

and one to each leaf, which is quite at variance with all we yet know respecting the stipules of *Jungermannia*. Dr. Smith, too, has described the stipules as entire.

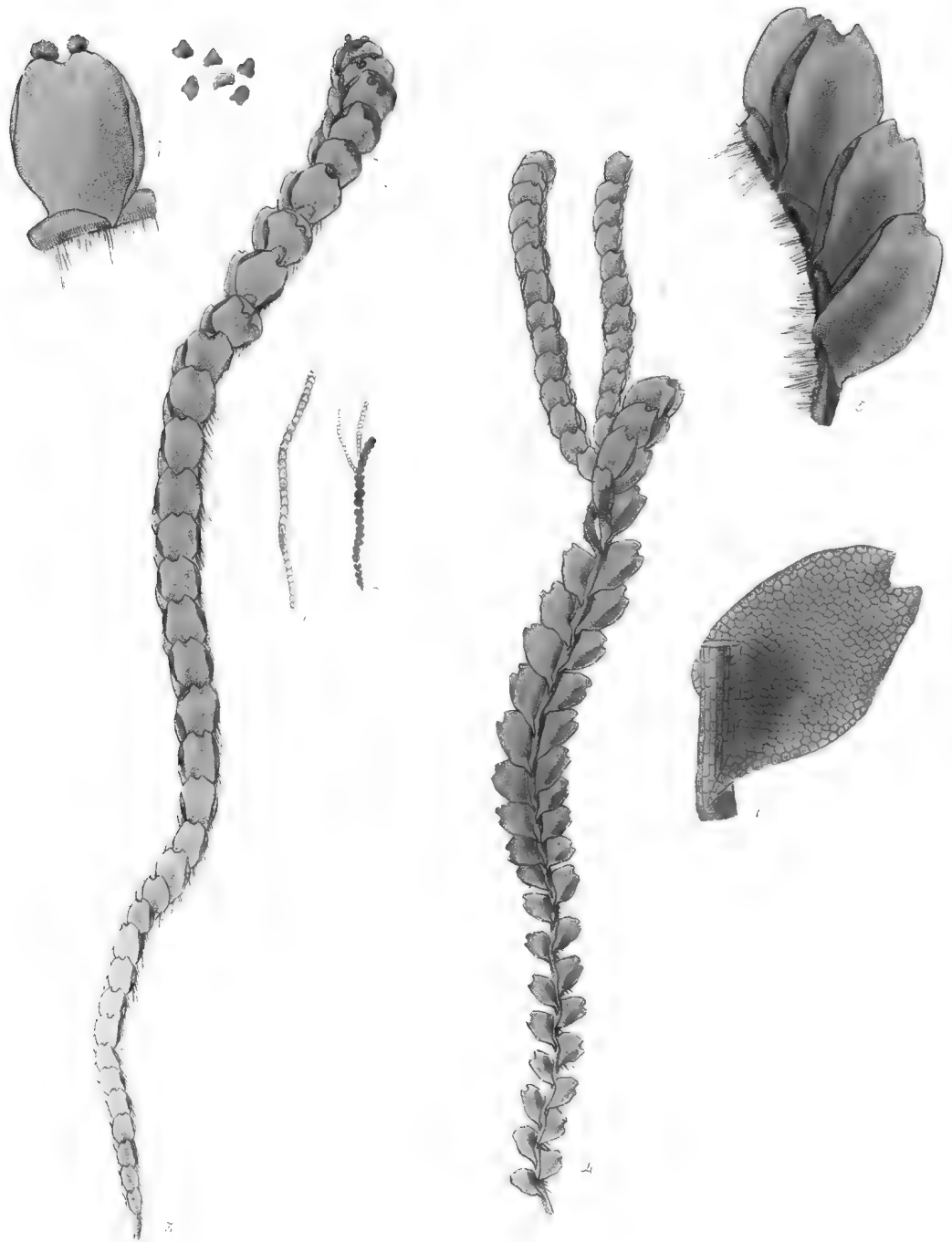
J. barbata is abundantly distinguished from every other species of the genus, by the shape of its leaves, its stipules, and its calyx, when taken in conjunction with the other parts of the plant. Its nearest affinity is, perhaps, with *J. stipulacea* and *J. Bantriensis* mss.; but these have only two teeth or segments to the leaves, and the stipules are undivided. In regard to the name, I have preferred that of Schreber, notwithstanding that *J. quinquedentata* is the oldest, and has been sanctioned by the authority of Linnæus. This latter is extremely inapplicable, and can only tend to mislead the student; for, I believe that, except by accident or injury, five segments are never seen to exist on the leaves of this species.

REFERENCES TO THE PLATE.

FIG.

1. Male plant, natural size.	
2. Female plant, ditto.	
3. Sterile plant, ditto.	
4. Male plant, magnified.....	6
5. Perigonial leaf.....	4
6. Anther	1
7. Sterile plant.....	6
8. Female plant	6
9. Portion of a stem and leaves	4
10. The same, seen on the under side	4
11. Leaf	3
12. Stipule	2
13. Perichetial leaf.....	3
14. Section of a calyx, with its pistilla.....	3
15. Seeds and spiral filaments	1
16. Gemmiferous apex of a stem	5
17. Gemmæ.....	1
18. Var. β , natural size.	
19. Individual of the same, magnified	6
20. Apex of the same	4
21. Stipule of the same	1
22. Its gemmæ	1





Fingermannia oreadenensis.

JUNGERMANNIA ORCADENSIS.

(TAB. LXXI.)

JUNGERMANNIA, caule erecto, simplici: foliis arcuè imbricatis, erectis vel patentibus, cordato-ovatis, apice emarginatis, marginibus recurvis.

HAB. Upon the *Wart hill*, the highest mountain of Hoy, in the Orkneys; found near its summit, in 1808.—Ambleside, in Cumberland; and at Catlaw, Kinnordy, Scotland.
Mr. Lyell.—Summit of Brandon. *Dr. Taylor*.

PLANT either growing in loosely-matted patches of a few inches in diameter, or, more frequently, scattered among mosses and other Jungermanniæ.

Roots consisting of dense, but short, simple, semipellucid fibres, which clothe the under surface of the plant.

Stems from one to two inches in length, erect, filiform, flexuose, simple, or only producing one or two innovations, and those generally towards the extremity of the plant.

Leaves closely placed and subimbricated, scarcely half a line long, of a widely ovate figure, approaching to cordate, patent, or erect and secund, at the base semiamplexicaul and decurrent; at the extremity, furnished with a rather deep and obtuse notch. The margins on each side of the leaf are recurved (f. 7) throughout the whole plant. The texture is compactly cellular; the *cellules* roundish. The color a brownish green.

No FRUCTIFICATION, either MALE or FEMALE, has yet been discovered; but

Gemmæ are found by Mr. Lyell on his Kinnordy specimens, situated on the points of the terminal leaves. They are collected into compact balls or spherules, and each granule, of which they are composed, is pellucid, of a yellowish green color, remarkably angular (f. f. 7. 8).

(*J. orcadensis*.)

BRITISH JUNGERMANNIÆ.

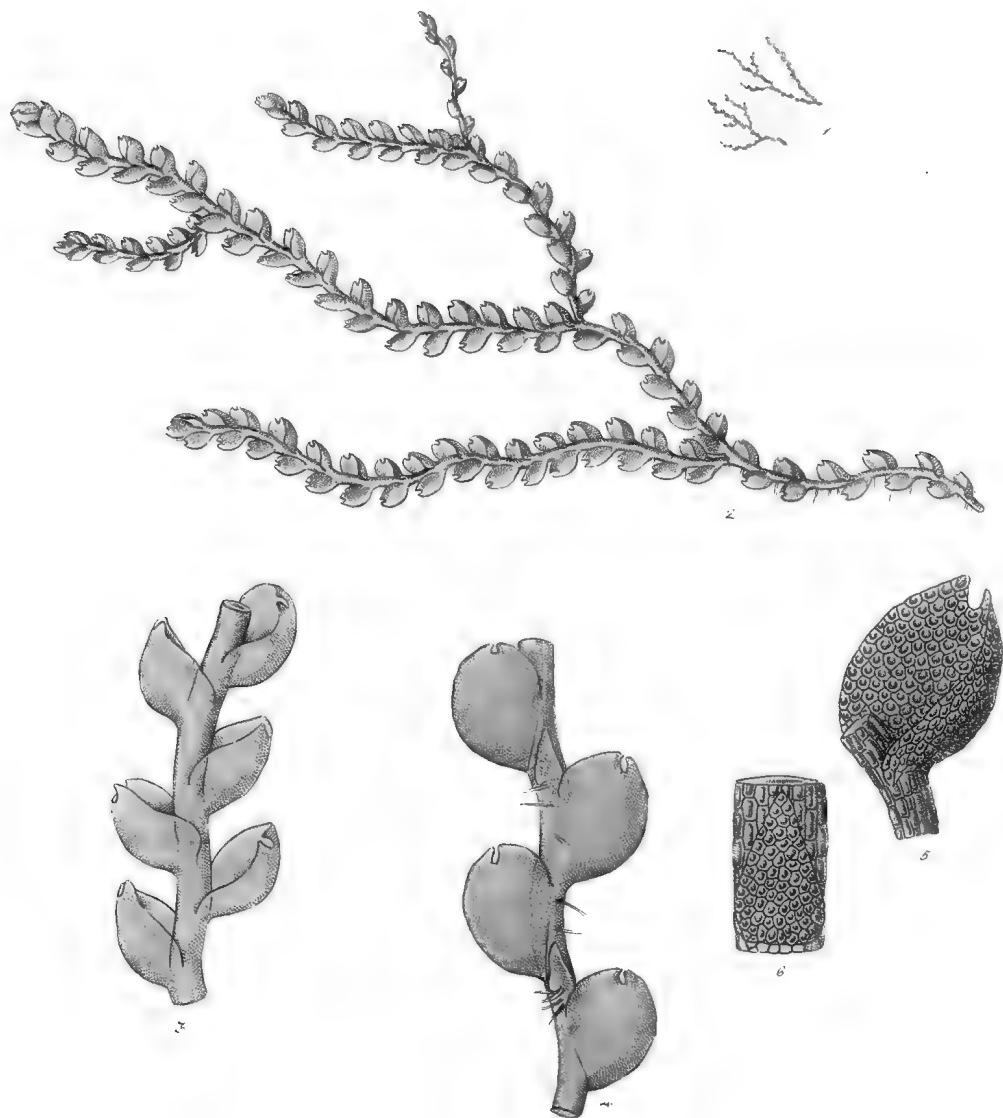
Specimens of this plant, which I have lately gathered in various parts of the mountains of Savoy and Switzerland, agree in every respect with those of our own country: so that, although I have never yet had the good fortune to meet with its fructification, I venture to describe it as a new species, thinking myself fully justified in so doing by the constancy of the characters here laid down. At first sight, *J. orcadensis* might be mistaken for a variety of *J. barbata*; but it will soon be seen, that, in the present species, the stipules are wholly wanting, and that the leaves are never trifid. From *J. ventricosa* it differs in its larger size, in the small obtuse notch of the leaves, and in its erect mode of growth; and from that, and every species to which it is in other respects at all allied, by the curiously recurved margins of its leaves.

I have taken its name from the country in which it was first found.

REFERENCES TO THE PLATE.

FIG.

1, 2. <i>J. orcadensis</i> , natural size.	
3. Gemmiferous plant, magnified	6
4. Sterile plant, with innovations	6
5. Portion of the stem and leaves	4
6. Leaf	2
7. Leaf, with clusters of Gemmæ	4
8. Gemmæ	1



Jungermannia albesceus.
Jungermannia albesceus. (L. V. R. M.)

JUNGERMANNIA ALBESCENS

(TAB. LXXII.)

JUNGERMANNIA, caule repente, ramoso: foliis distantibus, alternis, valdè concavis, propremodùm hemisphericis, emarginatis; stipulis ovato-lanceolatis, obtusis.

HAB. Near the summit of Ben Nevis, Scotland.

PLANT growing in large, loosely-matted patches.

Stems half or three-fourths of an inch in length, creeping, waved, filiform, branched twice or thrice in a dichotomous manner, and attached to the ground by

Radicles, short, simple, and subpellucid, which descend in tufts from the under side of the plant, and particularly near the stipules.

Leaves rather distantly and alternately placed, very small, of a nearly hemispherical figure, their base semiamplexicaul, their apex furnished with a single obtuse notch, having its segments somewhat connivent. The *texture* is remarkably succulent; the *cellules* large and prominent, like those of *J. minutissima*, and its affinities. The *color* a pale green, becoming almost white when dry, which has induced me to adopt the name of *albescens*.

The *stipules* are distantly placed: one between each pair of leaves. It is nearly of the width of the stem; of an ovato-lanceolate figure, quite entire.

The only British specimens I possess of this plant, are destitute of fructification; and, unfortunately, those which I found in such profusion, bearing calyces and capsules upon some of the loftiest of the Swiss Alps, are not arrived in this country; so that, however unwillingly, I must defer my figures and description of the rest of the plant, till the appearance of a supplementary number. Enough, however, is known of the species, to enable me to say, that I consider it one of the most decidedly marked in the genus, and that it will rank near *J. Francisci*, from which the much more concave leaves and entire stipules will always distinguish it.

(*J. albescens*.)

BRITISH JUNGERMANNIÆ.

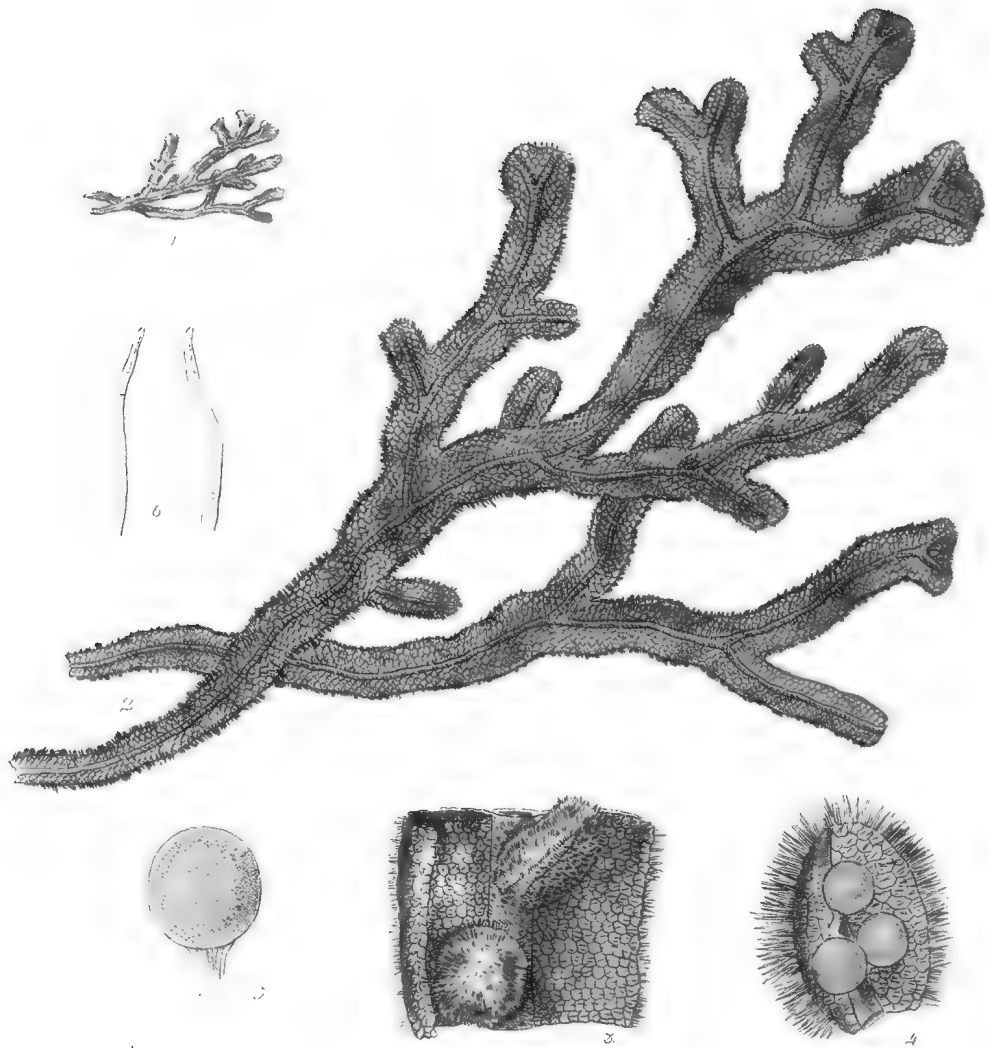
REFERENCES TO THE PLATE.

FIG.

1. <i>J. albescens</i> , natural size.	
2. The same, magnified	6
3. Portion of the stem, upper side	4
4. The same, seen beneath	4
5. Leaf	1
6. Stipule	1







Jungermannia pubescens.

Metzgeria pubescens. (Schrunk) Raddi

BRITISH JUNGERMANNIÆ.

(*J. pubescens.*)

JUNGERMANNIA PUBESCENS.

(TAB. LXXIII.)

JUNGERMANNIA, fronde lineari, dichotomâ, membranaceâ, costatâ, undique pubescente.

Jungermannia pubescens. SCHRANK, *Salisb.* p. 231. SCHRAD. *Samml.* II. p. 7. *Spic. Fl. Germ.* p. 75. LAM. *Fl. Fr. ed. 2.* II. p. 427. LAM. *Fl. Gall.* p. 91. ROTH, *Germ.* III. p. 414. WEBER et MOHR, *Fl. Crÿpt. Germ.* p. 435.

Jungermannia tomentosa. HOFFM. *Germ.* II. p. 91.

Jungermannia furcata. LEERS, *Herb.* p. 253. TEESDALE, in *Linn. Trans.* II. p. 120.

HAB. In Ireland and Scotland, common on wet rocks: in the alpine parts of England, in similar situations, it is also not rare.

PLANT covering rocks, sometimes to a considerable extent, with pale, glaucous-green patches.

Fronde an inch, or an inch and a half in length, horizontally creeping and imbricating each other very closely. Their width is scarcely more than half a line. They are branched in a dichotomous manner twice or thrice; the apices always obtuse, the edges waved, but entire; the center furnished with a strong nerve or rib; and the whole superficies, both above and below, and at the margin, covered with numerous short, white, pellucid, simple, jointless hairs, which give the plant a pubescent appearance. The *texture* is delicate, the *cellules* small and roundish, but indistinct on account of the pubescence.

The *color* is a pale green, rendered still paler by the white hairs.

MALE FRUCTIFICATION most abundant on the under side of the plant, and always attached to the mid rib. The

Anthers are two or three in number, inclosed in a young "innovatio frondis," spherical, of a pale brownish green color, terminating a short white *footstalk*. The innovations, on the decay of the anthers, appear to shoot out into perfect fronds, which, probably, are detached from the parent plant, and become new ones.

NO FEMALE FRUCTIFICATION has been discovered in this, nor, as far as I can learn, in any other country.

(*J. pubescens*.)

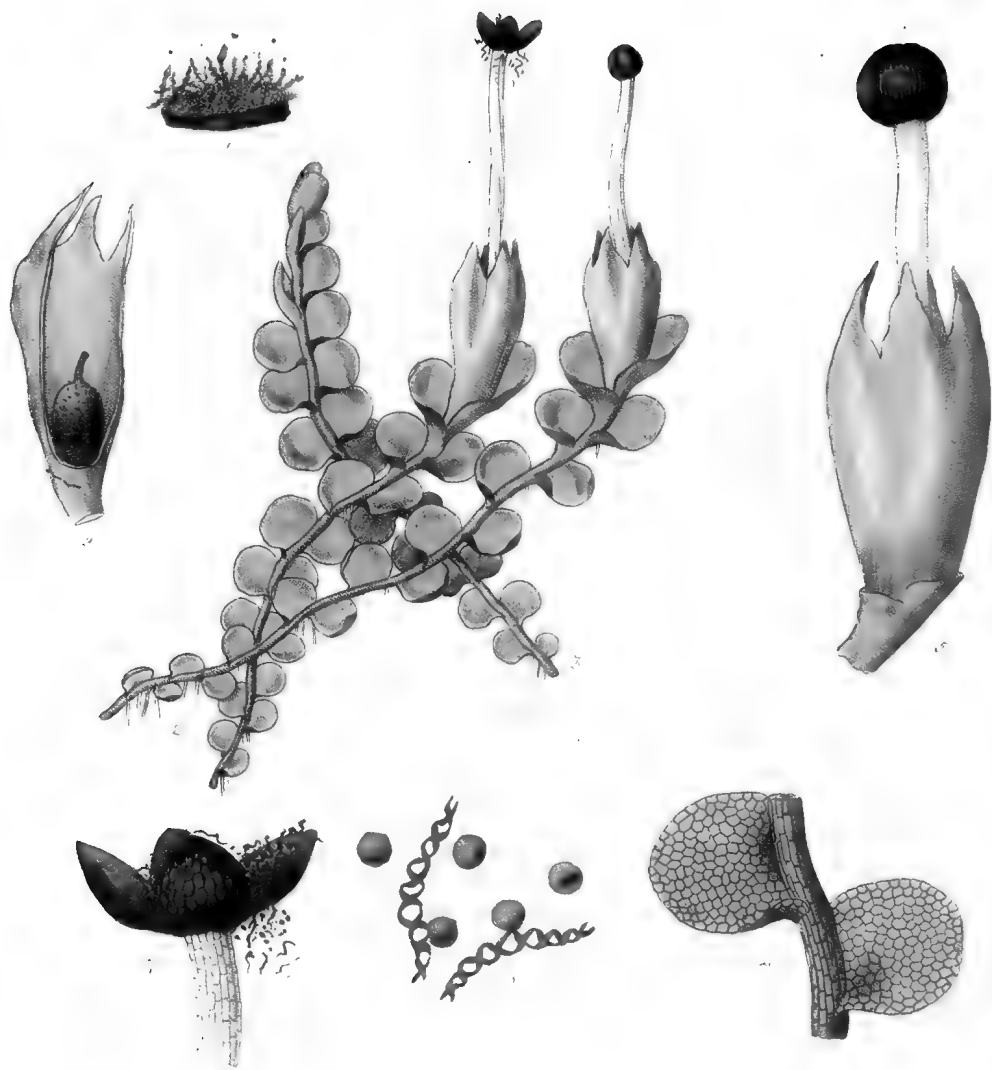
BRITISH JUNGERMANNIÆ.

I am far from considering it as certain that the above characters are sufficient to distinguish this plant specifically from *J. furcata*; since I can discover no difference but in the hairs, which in *J. pubescens* cover the whole plant, whilst in *J. furcata* they are either confined to the margin, or, at most, to that and the under side. Yet this difference appears to be very constant, and I have followed Mohr and Schrader in keeping the two separate.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. pubescens</i> , natural size.	
2. The same, magnified	6
3. Portion seen on the under side, with the Anther-bearing innovations	3
4. Section of an Anther, bearing innovation	2
5. Anther	1
6. Hairs	1



Fungermannia sphaerocarpa.

Epizoa sphaerocarpa Hook. & W.

BRITISH JUNGERMANNIÆ.

(*J. sphærocarpa.*)

JUNGERMANNIA SPHÆROCARPA.

(TAB. LXXIV.)

JUNGERMANNIA, caule adscendente, simplice: foliis orbiculatis: calycibus oblongo-obovatis, cylindraceis, quadrifidis (capsulâ sphericâ.)

HAB. Cadnam bog. *Mr. Lyell.*—In the neighborhood of Dublin. *Dr. Taylor.*—(It bears fruit early in spring.)

PLANTS growing in rather dense tufts of a pale green color.

Stems scarcely exceeding half an inch in length, ascending, filiform, waved, and, as far as I have yet seen, altogether simple; here and there, from their under side, throwing out small, simple, whitish, fibrous *radicles*.

Leaves rather distantly and bifariously placed; in the barren shoots, smallest at the base, and at the extremity; in the fertile ones, largest towards the calyx; of an exactly orbiculate figure, a little concave and decurrent, mostly horizontally patent; but sometimes towards the apex of the plant erect. Their *color* a pale green. Their *texture* delicate: reticulations small, roundish.

Perichætal leaves generally more ovate, and always larger than the rest; otherwise the same.

FRUCTIFICATION: MALE, unknown.

FRUCTIFICATION: FEMALE always terminal.

Calyx oblong, inclining to obovate, having no angles, cut at the extremity into four large, acute teeth or segments. *Color* and *texture* nearly the same as those of the leaves.

Germen ovate; *style* rather long, tubular.

Calyptra ovate, reticulated.

Peduncle twice or thrice the length of the calyx, white, pellucid, cellulose.

Capsule exactly spherical, brown, shining, splitting into four equal, widely ovate segments.

Seeds and *spiral filaments* deep fulvous brown; the *former* spherical, the *latter* short, and formed of a double *helix*.

(*J. sphærocarpa*.)

BRITISH JUNGERMANNIÆ.

Much as this species is allied in general habit, and in the foliage, to *J. scalaris* and *J. crenulata*, yet it may be at once distinguished when in fructification, from the former, by the exserted calyx, and from the latter, by this part being entirely free from angles, and by the four large teeth at its extremity. In the remarkably spherical shape of the capsule, it differs from both; and equally from *J. pumila*, which is moreover a much smaller plant, and has the calyx acuminate, plicate, and toothed, not quadrifid.

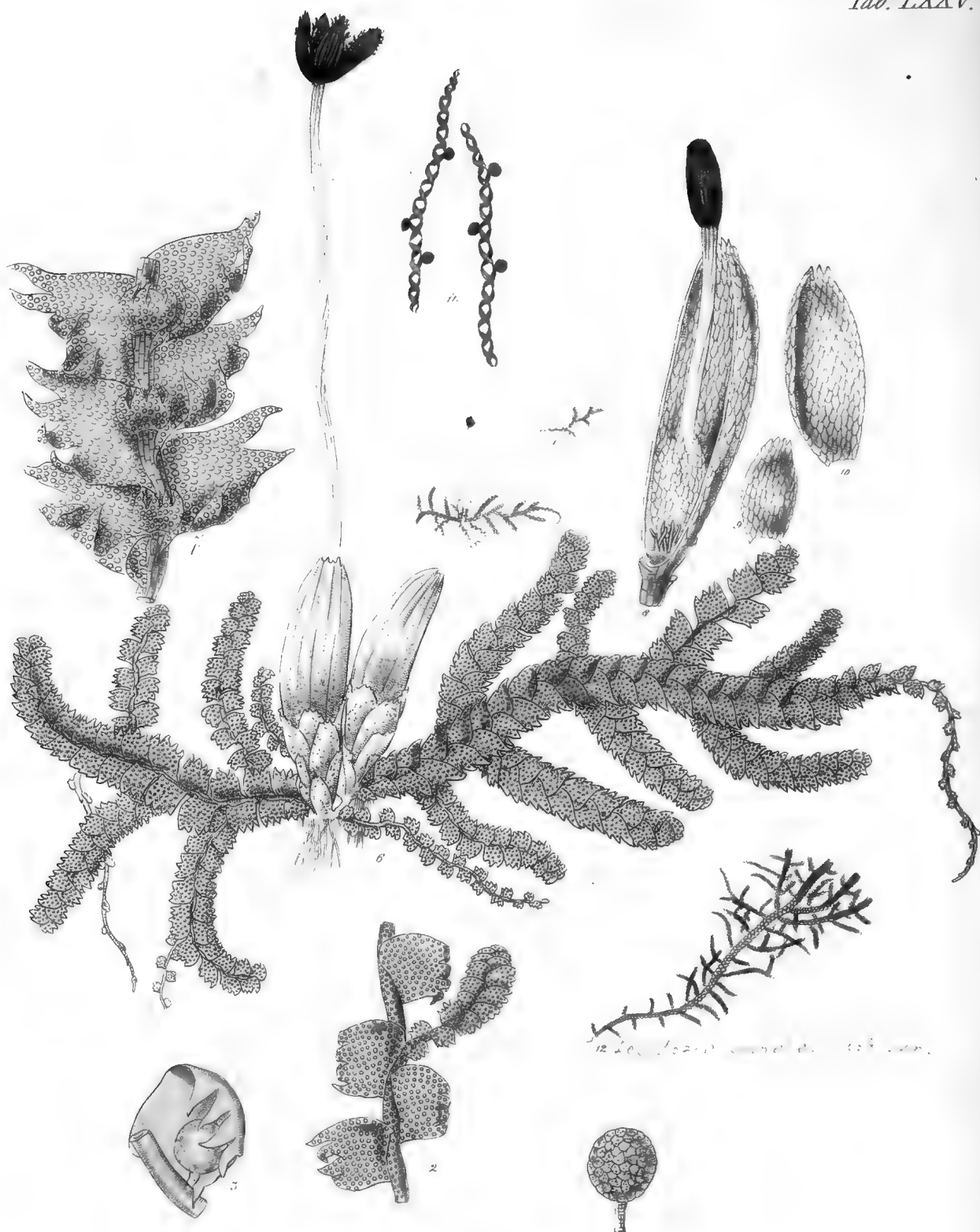
We are indebted to Mr. Lyell for our first knowledge of this plant, which Dr. Taylor soon after discovered in Ireland.

REFERENCES TO THE PLATE.

FIG.

- | | |
|-----------------------------------------------------|---|
| 1. <i>J. sphærocarpa</i> , natural size. | |
| 2. Fertile plants, magnified | 6 |
| 3. A sterile plant | 6 |
| 4. A portion of the stem and leaves | 3 |
| 5. Calyx with the capsule unopened | 4 |
| 6. Section of the calyx, shewing the Germen | 5 |
| 7. Capsule bursting and discharging its seeds | 3 |
| 8. Seeds and spiral filaments | 1 |





Jungermannia reptans.
Lepidozia reptans L. var.

JUNGERMANNIA REPTANS.

(TAB. LXXV.)

JUNGERMANNIA, caule repente, stellatim ramoso: foliis supernè imbricatis, subquadratis, incurvis, acutè quadridentatis: stipulis lato-quadratis, quadridentatis: fructu radicali; calycibus oblongis, plicatis, ore dentato.

Jungermannia reptans. LINN. *Sp. Pl.* p. 1599. *Syst. Nat.* II. p. 706. SCHRADER, *Samml.* II. p. 6. WEIS, *Plant. Crypt.* p. 119. WEBER, *Spic. Fl. Goet.* p. 144. WITH, *ed.* 3. III. p. 859. HOFFM, *Germ.* II. p. 86. ROTH, *Germ.* III. p. 398. SCHRANK, *Bavar.* II. p. 498. SCHREBER, *Spic. Fl. Lips.* p. 106. LEERS, *Herb.* p. 251. *Enum. Pl. Fl. Dan.* p. 42. HUDS. *Angl.* p. 513. LIGHTF. *Scot.* II. p. 779. SCHMIDEL, *Icones.* p. 259. t. 68. SCHMID, *Diss. f.* 8—13. LINN. *Syst. Nat. ed Gmel.* II. p. 1350. LAM. *Encycl. Method.* III. p. 282. *Engl. Bot.* t. 608. LAM. *Fl. Fr. ed. 2.* II. p. 433. WAHL. *Lapp.* p. 386. WEBER et MOHR, *Fl. Crypt. Germ.* p. 411.

Jungermannia minima, ramosa, polyanthos, foliis imbricatis, trifidis. HALL. *Helv.* III. p. 62. n. 1879.

Jungermannia foliis latiusculis obtusis, undulatis et veluti angulosis. MICHELI, *Nov. Gen.* p. 10. t. 6. f. 2.

Lichenastrum Trichomanis facie, foliolis multifidis, capitulis ex imis cauliculis nascentibus. RAII *Syn.* p. 113. n. 22.

Lichenastrum multifidum exiguum, ad basin florens, per siccitatem imbricatum. DILL. *Musc.* t. 71. f. 24.

β. PINNATA: ubique duplò major; ramis bipinnatis.

HAB. Abundant in woods, on banks and shady places, in various parts of the kingdom.
β on the borders of Lough Bray, plentiful. *Mr. Turner.*—Found near Bantry, and in other parts of Ireland, by *Miss Hutchins, Dr. Taylor, and Dr. Stokes.*

(*J. reptans*.)

BRITISH JUNGERMANNIÆ.

PLANTS covering the soil in dense tufts, or, as frequently happens, growing more loose and straggling among mosses and other Jungermanniæ.

Roots most numerous at the base of the plant, but also proceeding here and there from beneath the stipules on the under side of the shoots, in small tufts, composed of whitish, simple, pellucid fibres.

Stems creeping, horizontal, from half an inch to an inch and a half long, flexuose, filiform, of a greenish, or, in older specimens, of a yellowish color; cellulose, irregularly branched, growing in a sort of stellated manner, as in *J. bicuspidata*, *J. byssacea*, &c.; the branches beset with patent or horizontal simple pinnæ: sometimes the extremities of the shoots are of the same width as the rest, and obtuse; at other times, they are attenuated to a considerable length. From the under side of the stems, at uncertain distances, descend *flagella*, resembling, in a great measure, those of *J. trilobata*, and, like them, covered with foliaceous scales.

Leaves imbricated on the upper surface of the stems and branches, closely so for the most part; but, on the innovations and attenuated extremities of the branches, distant and very small: the rest are larger; all of them patent or horizontal, yet pointing a little in the direction of the end of the branch, of a nearly quadrate figure, convex, and having the apices incurved, and divided into four, or sometimes three, and occasionally five, acute teeth. Their color is a pale green, their reticulation small, the areolæ distantly placed, in lines, and at tolerably equal distances, as in *J. Turneri*.

Perigonial leaves generally at the extremity of an "*innovatio caulis*," more convex than the rest, and more closely imbricated (f. f. 2. 3).

Perichætal leaves, six or eight at the base of each calyx; the exterior ones the smallest, all of them ovate, convex, and, at the apex, cut into three or four small teeth: the texture of these is somewhat membranaceous; the color nearly white (f. f. 9. 10).

Stipules about twice the width of the stem (f. 7), of a somewhat quadrate figure, very convex, deeply cut into four acute segments. In texture they resemble the leaves.

MALE FRUCTIFICATION situated in the axillæ of the perigonial leaves, one or two in each, spherical, reticulated; *filament* short, white, slender.

FEMALE FRUCTIFICATION terminal on short proper footstalks, which originate at the base of the branches, and from their under side.

Calyx submembranaceous, nearly white, oblong, approaching to ovate, cylindrical at the base, at the apex somewhat plicate, the mouth crenato-dentate.

Calyptra obovate, whitish, reticulated, tipped with a short style.

Peduncle about three-fourths of an inch long, white, rather flexuose, pellucid, cellulose.

Capsule oblongo-ovate, deep brown, splitting into four equal, lanceolate valves:

Seeds and *spiral filaments* fulvous brown; the former spherical, the latter composed of a double helix.

The var. β differs in being more regularly pinnate, and of a much larger size: but the leaves, though more closely imbricated, agree, as well as the stipules, in every essential particular with those of α .

BRITISH JUNGERMANNIÆ.

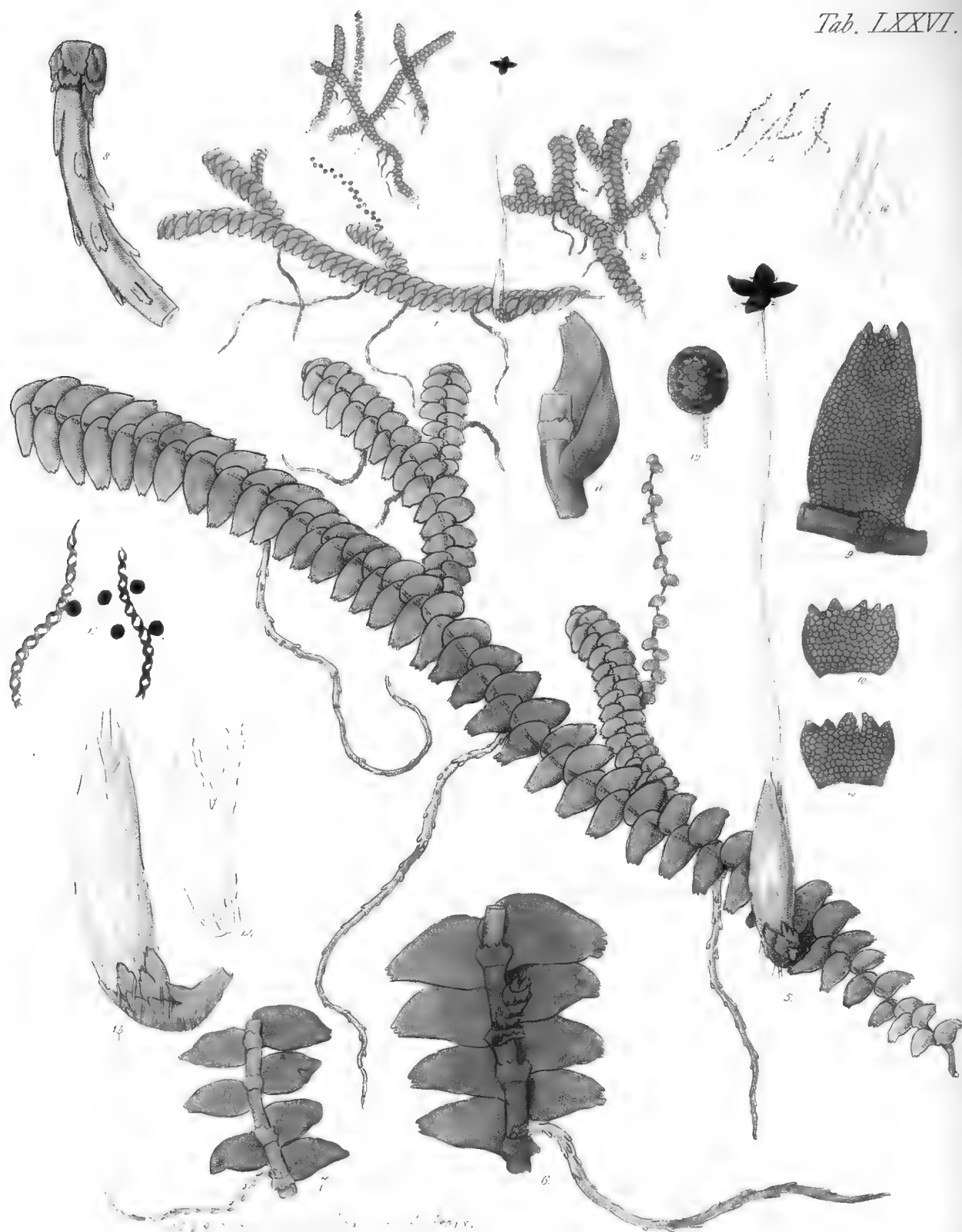
(*J. reptans.*)

The species here figured and described, which scarcely yields in beauty to any one of the genus, may be considered as one of the most universally dispersed throughout Europe. In habit, it is closely allied to *J. trilobata*, having, like that plant, its leaves imbricated on the upper surface, large dentate stipules, flagella beset with leaf-like scales, and a whitish membranaceous calyx, proceeding from the under side of the stems. The var. β , though differing at first sight so materially from α , is distinguishable only by its great size and bipinnate ramification. The extremities of the uppermost pinnæ, indeed, are almost always obtuse; those of the lower ones attenuated. This var. is rarely found in fructification, Miss Hutchins alone having been so fortunate as to meet with it in that state.

REFERENCES TO THE PLATE.

FIG.

1.	Male plant, natural size.	
2.	Portion of the same, magnified	6
3.	Perigonal leaf and Anther	2
4.	Anther	1
5.	Female plant, natural size.	
6.	The same, magnified	6
7.	Portion of the stem with leaves and stipules, seen from below	3
8.	Calyx cut open, to shew the calyptra	4
9.	Exterior perichæatial leaf	4
10.	Interior perichæatial leaf	4
11.	Seeds	1
12.	Var. β . natural size.	



Jungermannia trilobata?
Bazzania trilobata L. Cr.

JUNGERMANNIA TRILOBATA.

(TAB. LXXVI.)

JUNGERMANNIA, caule repente, flexuoso, subramoso: foliis supernè imbricatis, ovatis, convexis, obtusè tridentatis: stipulis lato-subquadratis, crenatis: fructu e parte inferiore caulis egrediente; calycibus oblongis, subacuminatis, ore lateralitèr fisso.

Jungermannia trilobata. LINN. *Sp. Pl.* II. p. 1599. *Fl. Suec.* p. 401. WEIS, *Plant. Crypt.* p. 118. WEBER, *Spic. Fl. Goet.* p. 143. SCHRANK, *Bavar.* II. p. 497. VILLARS, *Delph.* III. p. 924. LEERS, *Herb.* p. 250. *Enum. Pl. Fl. Dan.* p. 42. HUDS. *Angl.* p. 513. ROTH, *Germ.* III. p. 396. LINN. *Syst. Nat. ed Gmel.* II. p. 1349. WITH. *ed.* 3. III. p. 859. LAM. *Encycl. Meth.* III. p. 281. LAMARCK, *Fl. Fr. ed.* 2. II. p. 432. WEBER et MOHR, *Crypt. Germ.* p. 409.

Jungermannia radicans. HOFFM. *Germ.* II. p. 87. *Engl. Bot.* t. 2232.

Muscoides terrestre repens, ex obscuro virescens, foliis superioribus et inferioribus ad extremitatem dentatis. MICH. *Nov. Gen.* p. 10. t. 6. f. 2.

Jungermannia caulibus convexis, foliis descendentibus, imbricatis, tridentatis. HALL. *Helv.* III. p. 59. n. 1866.

β. MINOR; omnibus partibus duplo minoribus.

Jungermannia triangularis. SCHLEICHER, *Cent.* 2.

γ. MINIMA; foliis valdè minutis, indistinctis, distantibus, sæpè bidentatis integrisque.

HAB. Subalpine parts of Great Britain, Scotland, and Ireland.—β is found in more elevated situations, among rocks; and γ has been discovered in Ireland by *Miss Hutchins.*

PLANT growing in large and generally dense patches, sometimes being more than a foot in diameter, throwing out a few fibrous radicles, which are often forked, from the lower surface of the stem (f. 16).

Stems from three to five inches in length, creeping horizontally upon the ground, and imbricating each other; sometimes simple, and beset here and there with innovations, at other times once or twice branched in a dichotomous manner, flexuose, rather rigid, of a brownish color. Flagella abundant, about an inch long, tapering, descending from the under side of the stem, where they have their origin, each at the base of a

stipule: they are beset with minute foliaceous scales, jagged at the extremity, which seem to be the rudiments of leaves and stipules: immediately at the base, however, these are imbricated all round.

Leaves more or less closely placed, and imbricated on the upper side of the stem, horizontal, distichous, attenuated, of an ovate figure, cut at the end into three obtuse teeth. They are of a firm *texture*, composed of small roundish reticulations: the surface is a little shining, of an olive green *color*, varying with more or less of a brown tint, in proportion as they are more or less exposed to the sun (f. f. 6. 9).

Perigonal leaves situated upon short, proper branches, or innovations (f. 6), closely imbricated, so as wholly to conceal the stem and stipules; their form is narrow and ovate, with a remarkably ventricose base; the end, as in the cauline leaves, cut into three, and sometimes four, obtuse and usually unequally-sized teeth.

Perichætal leaves embracing the base of the calyx, composed of small ovate membranaceous scales, jagged at the extremity.

Stipules, one to each pair of leaves, widely subquadrate, notched.

MALE FRUCTIFICATION situated in the axillæ of the perigonal leaves (f. f. 6. 11).

Anther spherical, reticulated, terminating a small white filament.

FEMALE FRUCTIFICATION standing on short, proper footstalks, arising from within the stipules, from the under side of the plant, curved upwards.

Calyx nearly two lines in length, oblong, narrower upward, the mouth slit down on one side, destitute of teeth: its *texture* membranaceous and reticulated under a highly magnifying power; its *color* nearly white.

Calyptra oblongo-obovate, tipped with a short style, splitting vertically for the emission of the capsule (f. 14).

Peduncle from an inch and a half to two inches long, somewhat flexuose, pellucid, white, cellulose.

Capsule ovate, dark shining brown.

Seeds and *spiral filaments* brown: the latter composed of a double *helix*; the former spherical.

The *var. β* and *γ* differ principally from *α* in size: the *β* being intermediate, about half the usual size of *α*, yet, in other respects, resembling it. Its fructification, as I have lately ascertained by a great profusion of specimens gathered in Switzerland, is precisely the same. *γ* has more distantly-placed leaves, and these so small, that they are scarcely visible to the naked eye. Of the teeth, there are frequently only two, and sometimes none.

Jungermannia trilobata, although no uncommon inhabitant of various alpine countries in Europe, still does not appear to have been described by any author in perfect fructification. Roth's character of this state of the plant so ill accords with our own, that I cannot help suspecting that he must either have mistaken *J. quinquedentata* for it, or else have confounded the two. In this country, I am not aware that even calyces have been found, and I have been obliged myself to have recourse to German individuals for the whole of the drawing of the fructification.

BRITISH JUNGERMANNIÆ.

J. trilobata.

Dillenius has no where noticed this plant; nor does his Herbarium, at Oxford, possess a specimen. The Dillenian synonym of most authors belongs to *J. quinquedentata*. Micheli's figure is too accurate to be mistaken.

The affinity of this plant with *J. reptans*, I have already noticed under that species: but it is not of such a nature as to render it necessary for me to point out how they differ specifically.

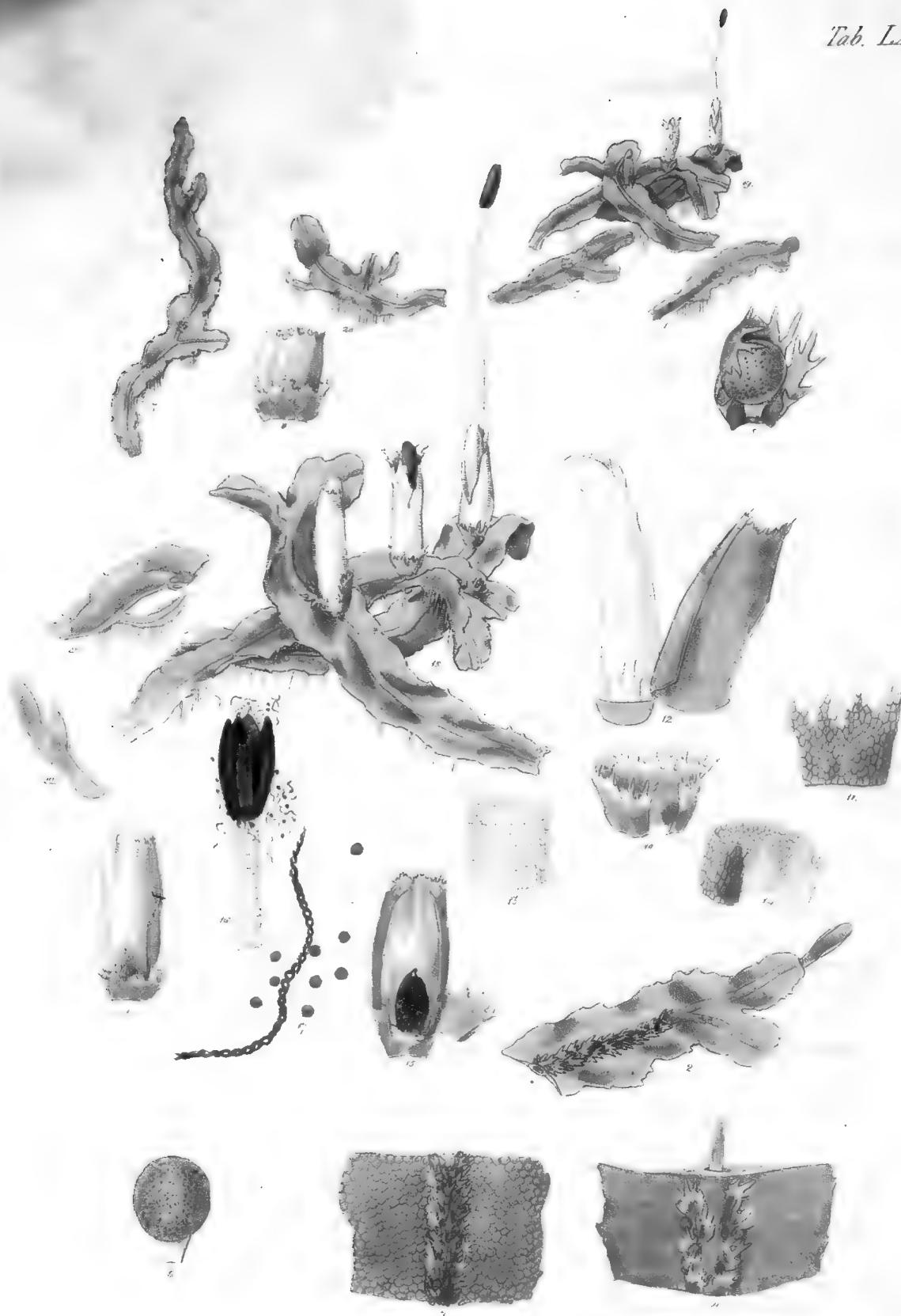
Dr. Mohr's remark in his excellent *Cryptogamic Flora of Germany*, on this *Jungermannia*, is too excellent to be omitted: "Variat eximie magnitudine, foliis laxioribus, densioribus, brevioribus, longioribus:" he adds, that, "in omni ferè globi terrarum regione provenire videtur."

REFERENCES TO THE PLATE.

FIG.

1.	<i>J. trilobata</i> , natural size, female plant.	
2.	Male plant, ditto.	
3.	Var. β , ditto.	
4.	Var. γ , ditto.	
5.	Female plant, magnified	6
6.	Under portion of a male plant, shewing also the stipules	4
7.	Var. γ	4
8.	Portion of a flagellum	3
9.	Leaf and stipule	2
10.	Stipule	1
11.	Perigonial leaf	4
12.	Anther	1
13.	Calyx and perichæatial leaves	3
14.	Corolla	2
15.	Seeds and spiral filaments	1
16.	Roots	1





Jungermannia Lyellii
Jungermannia Lyellii

JUNGERMANNIA LYELLII.

(TAB. LXXVII.)

JUNGERMANNIA, fronde oblongâ, subramosâ, tenerâ, costatâ, margine subintegerrimo: fructu e superiore parte frondium; calyce duplice; exteriore perbrevis, margine laciniato-dentato; interiore longè exserto, cylindræco, subplicato; calyptrâ calycem subexcedente.

HAB. Bogs in the New Forest, Hampshire, and at Drumby Airy, a waterfall on the Noran, Angussshire. *Mr. Lyell.*—Bogs among *Sphagnum latifolium* and *Hookeria lucens*, near Bantry, Ireland. *Miss Hutchins.*—From some indifferent specimens, gathered at Tunbridge High Rock, *Mr. Foster's Habitat*, in the "*Tunbridge List of Plants*," it is, probably, the "*New Marchantia*," mentioned in that work.—(Bears fruit in May.)

PLANT growing in small loosely-matted patches.

Roots not very numerous, simple, pellucid, almost colorless, proceeding from the nerve on the underside of the plant.

Fronde generally about an inch long, sometimes twice, or even, though very rarely, three times that length, horizontally appressed to the earth, or to the substances on which it grows; of an oblong shape, being two or three lines in diameter, and nearly linear throughout, simple, or throwing out one or two lateral short branches (f. 7), or forked at the extremity (f. f. 1. 19); the margin waved, frequently entire, now and then beset with a few distant, unequally-sized teeth; in the centre of the frond, and running the whole length of it, is seen a very distinct nerve, rather prominent on both sides; the interior substance of this is hard and rigid (f. 4), and quite unlike that of the rest of the plant, of which the texture is remarkably thin and delicate, much more so than in *J. epiphylla*, and approaching nearer to that of *J. furcata*. The *reticulation* is small, and the *areolæ* roundish: the *color* a pale but pleasant green.

Innovations (f. 20) are not unfrequent on this plant, arising from the underside of the nerve, as in *J. furcata*. In these, at first, nearly the whole breadth of the young shoot is occupied by the nerve, but they gradually bear a nearer resemblance to the parent plant, become furnished with roots, and are detached from the old frond. Sometimes these innovations are simple (f. 21), sometimes forked or branched, as is represented at f. 22.

MALE FRUCTIFICATION (f. f. 1 to 4) situated upon the nerve on the upper side of the frond, generally near the middle or base, and always on distinct plants from those which produce the capsules.

(*J. Lyellii.*)

BRITISH JUNGERMANNIÆ.

Perigonial scales (f. 2) numerous, crowded, sometimes forming a beautiful fringe on each side the nerve (f. 4), at other times altogether concealing it (f. f. 2. 3); they are, each of them, of an ovate or roundish figure (f. 5), much lacinated and toothed, concave on the underside. Among these scales

The *Anthers* are dispersed (f. f. 3. 4), each of them (f. f. 5, 6) roundish-ovate, yellow-brown, supported upon a very short white *footstalk*.

FEMALE FRUCTIFICATION placed always on the nerve, on the upper surface of the frond, and generally near the centre.

Calyx double: the *exterior* (f. f. 8. 10) the shortest, and very much cut and lacinated at the margin; its *texture* nearly resembles that of the frond, or, if any thing, is rather more delicate: the *reticulation*, too (f. 11), is composed of more oblong *areolæ*: the *interior* (f. f. 9. 15. 12) is still more delicate (f. 14), of a paler color, thrice or four times the length of the outer one, subcylindrical, a little plicate and toothed at the mouth, at length torn on one side by the bursting forth of the capsule (f. 18).

Germen at first ovate (f. 15), tipped with a short, obtuse style; afterwards lengthened out, so as to equal and often exceed the inner calyx.

Calyptra (f. 18) cylindrical, of a rather thick subcarneous substance (f. 13), white, with very minute oblong reticulations. Near its base are a few *abortive pistilla*.

Peduncle nearly an inch long, white, succulent, semipellucid, a little flexuose.

Capsule oblongo-ovate, splitting into four, or sometimes only three, valves, and these are not unfrequently united at their apices, as is the case with *J. Hookeri* and some other species.

Color rather a pale brown or chocolate.

Seeds numerous, minute, spherical, fulvous. *Spiral filaments* of the same color, very long, formed of a double *helix*, closely twisted.—Whether these are attached, as in *J. epiphylla*, to the base of the capsule, or at the extremity, as in *J. pinguis* and *J. furcata*, I am unable to determine, for want of specimens in a sufficiently good state of preservation.

I have observed no *Gemmæ* on any specimens that I have yet met with.

To none can this species be with more propriety dedicated than to its discoverer, Charles Lyell, Esq., a gentleman to whose unwearied researches almost every page of this work bears unequivocal testimony, and to whom I am happy in being able thus publicly to express my gratitude and esteem; while every one who is acquainted with him, will agree with me in saying,

“E a me suoi meriti

“E l'ingegno non stanco

“Tra piante e carmi e studj, e il cuor si franco,

“Costumi ornati, e il viver dolce e cheto,

“Anche son noti.”

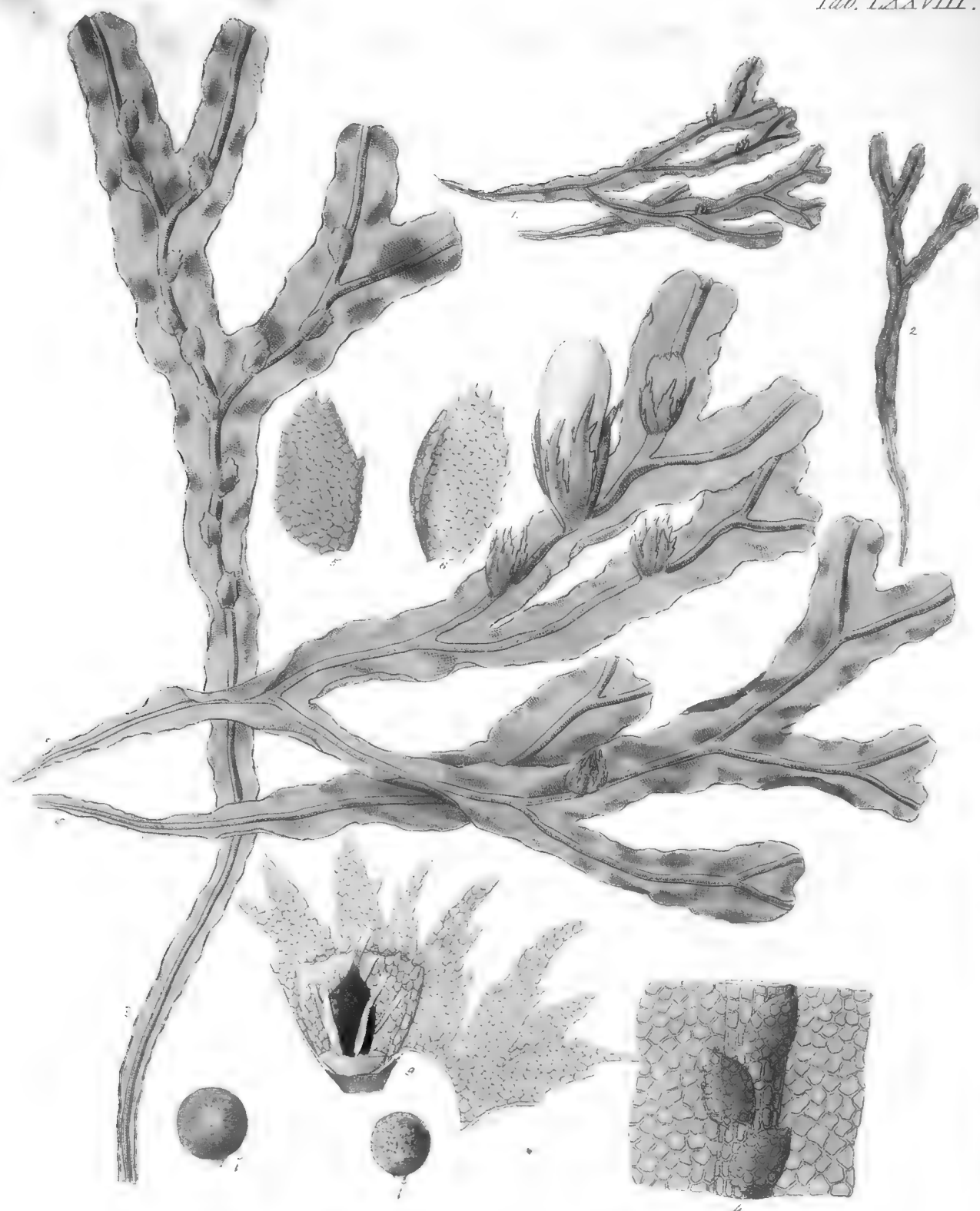
It was in the neighbourhood of his seat, Bartley Lodge, in the New Forest, Hampshire, that my valued friend first met with this highly curious plant, which he has since found in boggy places on his estate at Kinnordy, in Angusshire. It grows likewise in Ireland, and I have the same species given me by Mr. Dickson, who says it was gathered in the East Indies. The following, *J. hibernica*, although so nearly allied to this, I believe to be perfectly distinct. It accords in

general habit, in texture of the frond, in the double calyx, and in the male fructification arising from beneath the perigonal scales; but it is removed from it by the different substance of the nerve, by the more deeply-divided outer calyx, by the shortness of the Corolla, and by the differently-shaped, and distantly-placed, perigonal scales. I have received several *Jungermannia*, both from the East and West Indies, which agree in general habit with both these, and which will probably be found to have the same fructification.

REFERENCES TO THE PLATE.

FIG.

1. <i>J. Lyellii</i> , male fructification, natural size.	
2. Portion of the same, magnified	6
3. Smaller portion	4
4. Part of the frond, with a portion of the internal substance of the nerve	4
5. Perigonal scale and Anther	2
6. Anther	1
7. Young female frond, natural size.	
8. Young calyces, magnified	4
9. Calyces, more advanced	4
10. Exterior calyx laid open	3
11. Portion of ditto, to shew the reticulation	2
12. Inner calyx laid open, to shew the corolla	3
13. Transverse portion of the corolla	2
14. Portion of the inner calyx	2
15. Calyces, cut open to shew the germen	4
16. Capsule bursting	3
17. Seeds and spiral filaments	1
18. Cluster of female plants, magnified	6
19. The same, natural size.	
20. Single frond, with innovations, natural size.	
21. Portion of ditto, magnified	6
22. Innovation	4



Jungermannia hibernica!
Jungermannia hibernica (Lamour.)

JUNGERMANNIA HIBERNICA.

(TAB. LXXVIII.)

JUNGERMANNIA, fronde oblongâ, dichotomâ, tenerâ, costatâ, margine integerrimo: fructu e superiore parte frondium; calyce duplici; exteriore perbreui, laciniato; interiore longè exserto, ovato-cylindraceo, subplicato; calyptrâ calyce interiore multo brevior.

HAB. Among *Sphagnum cuspidatum* and *Jungermannia emarginata*, on the shores of Lough Bray, a very elevated situation, near Dublin. Dr. Taylor.—Catlaw, near Kinnordy, Angusshire. Mr. Lyell.—(It produces ripe capsules about the middle of April.)

PLANT growing intermixed with various Mosses and other Jungermanniæ, in small, loosely-entangled, imbricated patches.

Roots few, and principally proceeding from the lower parts of the frond, small, fibrous, pellucid, simple.

Frond from two to four inches long, procumbent, oblong, about two, or, towards the extremity, where it is always the broadest, even three lines in diameter, once, twice, or even thrice branched, the fertile plants the most so, and always in a dichotomous manner: the branches sometimes very patent: the whole plant is more or less waved or undulated, but especially at the margins, which are quite entire, never producing teeth, as in *J. Lyellii*. Like that plant, the substance is very delicate, pellucid, reticulated; but the nerve scarcely differs from the rest of the frond, except in its thickness, and in the more compact situation of the cellules, never having its internal substance so hard, I might almost say, ligneous, as in the last-mentioned species. The color is a pale green, at the base yellowish brown.

I have seen no innovations on this species.

The MALE FRUCTIFICATION (f. f. 2 to 4) is produced upon the nerve on the upper side of the frond, as far as I am able to discover, always on distinct individuals from the female.

Perigonal scales few, distantly placed, arising from the top of the nerve, and closely appressed to it, but having an oblique direction, alternately pointing to the right and left (f. 3), and extending nearly the whole length of the plant; each of them is of an ovate figure, convex on its upper surface, at the margins slightly and irregularly toothed. (f. f. 4. 5. 6)

(*J. hibernica*.)

BRITISH JUNGERMANNIÆ.

One or two *Anthers* are situated upon the nerve, and are entirely concealed by the perigonal scales. They are (f. 7) nearly spherical, of an olive-green or brownish color, placed on a very short, pellucid footstalk.

FEMALE FRUCTIFICATION arising from the upper side of the nerve of the frond, near the middle or upper extremity.

Calyx double: the *exterior one* short, and cut nearly down to the base into lanceolate divisions or laciniae, which themselves are toothed or laciniated at their margins (f. 9): the *texture* is altogether that of the frond, whilst the *inner calyx* is, on the contrary, more delicate, of a paler color, thrice the length of the outer, obovate, approaching to cylindrical, at the mouth cut down on one side, and slightly toothed. Such are the characters of the full-grown interior calyx, which are quite different from its young state: this, even after the perfection of the Germen, is shorter than the exterior one, cup-shaped, and slightly toothed or notched at the margin (f. 9).

Germen ovate, dark green, tipped with a rather large, hollow style, and surrounded at its base by several linear-lanceolate, abortive pistilla (f. 9).

Corolla white, between membranous and carnose, ovate, never exceeding half the length of the inner calyx.

Peduncle an inch or more in length, white, succulent, flexuose, and cellular.

Capsule oblongo-ovate, opening into four, or sometimes only three, valves, which are often united at their apices by the twisting together of the filaments.

Seeds fulvous brown; filaments of the same color, closely and spirally twisted in a double helix, and apparently attached to various parts of the inner valves of the capsule.

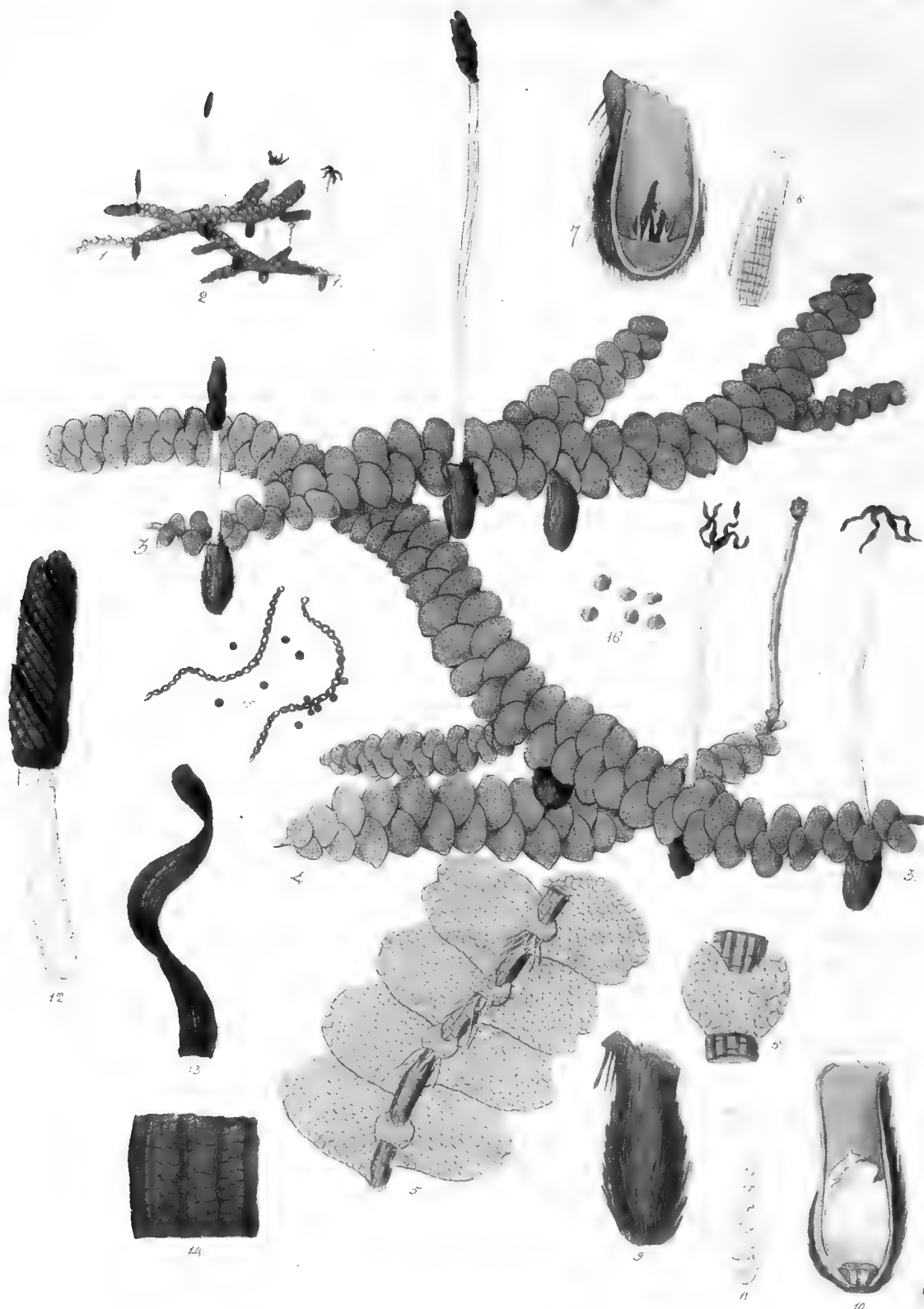
Gemmæ none, that I have yet seen.

I exceedingly lament, that the perfect fructification of this species was not discovered till after the annexed plate was finished by the engraver. By means of it, I am the more confirmed in the distinct nature of the species, though, even from the less complete specimens, there appeared to be sufficient characters to enable a botanist to distinguish it from *J. Lyellii*. It is altogether a larger and more branched plant; divided always in a dichotomous manner; and furnished with a nerve, not essentially differing in substance from the rest of the frond. I have noticed, under *J. Lyellii*, how the calyx and the corolla differ in the two species: an equally remarkable difference, and, as far as my observation has gone, an equally constant one, exists in the perigonal scales. In *J. Lyellii* they are rounded, deeply cut at their margins, thickly clothing the sides, and frequently the top of the nerve, and not closely appressed to it. In *J. hibernica*, on the contrary, they are distantly ranged, and point obliquely and alternately to the different sides of the nerve. The latter appears also to be an alpine plant, having hitherto been found only in very elevated situations. In the supplement of this work will be given figures of the perfect capsules.

REFERENCES TO THE PLATE.

FIG.

1. *J. hibernica*, young female plant, natural size.
 2. Male plant, ditto.
 3. Male plant, magnified..... 6
 4. Portion of the male frond 4
 5. Perigonial scale, upper side 2
 6. Perigonial scale, lower side..... 2
 7. Anthers..... 1
 8. Female plant, with young fructification 6
 9. Calyces, interior and exterior, cut open to shew the Germen and barren pistilla.
-



Jungermannia trichomanis.
 (Kantia trichomanis Lindb.)
Calopogon trichomanis L. Cordo

JUNGERMANNIA TRICHOMANIS.

(TAB. LXXIX.)

JUNGERMANNIA, surculo repente, subsimplice; foliis bifariis, imbricatis, horizontalibus, convexis, ovatis, integris emarginatisque; stipulis rotundatis, lunulari-emarginatis: fructu laterali; calycibus subterraneis, oblongis, carnosis, hirsutis; ore crenato.

Jungermannia Trichomanis. DICKS. *Plant. Crypt. Fasc.* III. t. 8. f. 5. SCHRADER, *Samml. Lief.* II. p. 7. SCOP. *Carn.* II. p. 769. TIMM. *Prodr. Fl. Megap.* n. 871. WEBER, *Spic. Fl. Goet.* p. 148. OEDER, *Enum. Pl. Fl. Dan.* p. 43. ROTH, *Germ.* p. 395. LIGHTF. *Scot.* II. p. 769. SWARTZ, in *Act. Nov. Ups.* IV. p. 243. *Engl. Bot.* t. 1875. MOHR, *Fl. Crypt. Germ.* p. 405. WAHL. *Lapp.* p. 387. SPRENGEL, in *Wetter. Annal.* p. 24. t. 4. f. 8. SCHWAEGR. *Musc. Hepat. Prodr.* p. 16.

Jungermannia scalaris. SCHMID. *Diss. de Jung.* p. 20. f. 17. and 18. (*Gemmæ*.) LAM. *Fl. Fr.* ed. 2. II. p. 428. *Fl. Gall. Syn.* p. 92. *Encycl. Bot. Suppl.* III. p. 163. WITH. *Bot.* III. p. 852. SCHREB. *Spic. Fl. Lips.* p. 103.

Jungermannia fissa. SCOPOLI, *Carn.* II. p. 348. LIGHTF. *Scot.* II. p. 770. *Enum. Pl. Fl. Dan.* p. 43. SWARTZ, in *Act. Nov. Ups.* IV. p. 244. VILLARS, *Delph.* IV. p. 424. LAMARCK, *Fl. Fr.* ed. 2. II. p. 429. *Fl. Gall. Syn.* p. 92. *Encycl. Bot. Suppl.* III. p. 163.

Jungermannia sphærocephala. WITH. *Bot.* ed. 3. III. p. 854. LINN. *Syst. Nat.* ed. Gmel. II. p. 1349. RELH. *Cant.* p. 438.

Mnium Trichomanis. LINN. *Sp. Pl.* p. 1579. *Syst. Nat.* II. p. 701.

Mnium fissum. LINN. *Sp. Pl.* p. 1579. *Syst. Nat.* II. p. 701.

Jungermannia, foliis integerrimis, planis, ovatis, distichis, extremo caule setifero. HALL. *Helv.* III. p. 57.

Jungermannia, foliis bidentatis in apice fragifera. HALL. *Helv.* III. p. 59.

Mnium Trichomanis facie, foliolis bifidis. DILL. *Hist. Musc.* t. 31. f. 6.

Mnium Trichomanis facie, foliis integris. DILL. *Hist. Musc.* t. 31. f. 5.

Jungermannia terrestris repens, foliis ex rotunditate acuminatis, bifidis, aperturâ pene visibili. MICHELI, *Nov. Gen. Pl.* p. 8. t. 5. f. 14.

HAB. In moist places on the ground, on heaths, in woods, and in marshes, in various parts of England, Scotland, and Ireland.—(It produces *capsules* during most of the summer months, if the weather be moist, and *Gemmæ* early in the spring.)

PLANT growing in large, dense, or scattered patches, frequently covering a considerable surface of ground.

(*J. Trichomanis*.)

BRITISH JUNGERMANNIÆ.

Roots (f. 5) descending from the under part of the stem, most abundantly near the base, in small, fibrous bundles, that are placed close by the *stipules*.

Stems from one to two inches long, slender, flexuose, procumbent, simple, or producing, here and there, young shoots or innovations, which exactly resemble the parent plant: their *texture* is delicate: the *cellules* large, oblong: the *color* a pale green.

Leaves rather closely arranged, and imbricated over the upper surface of the stem, so as altogether to conceal it; usually small at the base and at the extremity of the plant, largest in the middle, where they are not unfrequently half a line long; their direction is horizontal; their figure widely ovate, above convex; many of them are entire, whilst others are cleft with a wide and obtuse notch at the apex (f. 5); the margins are every where free from serratures. The *cellules* are large and roundish, and give the leaves a punctated appearance when the plant is dry: the *texture* delicate: the *color* a pale, and oftentimes a glaucous green.

Stipules: (f. f. 5, 6.) Of these one is placed between each pair of leaves. Their figure is roundish, and they are furnished with a deep, and somewhat lunular incision or notch at the apex, resembling, in some degree, that of *J. connivens*. In *color* and *texture* the stipules resemble the leaves.

MALE FRUCTIFICATION unknown.

FEMALE FRUCTIFICATION lateral, and issuing from the under side of the stem.

Calyx (f. 9) attached by one side of its mouth to a short footstalk, in such a manner as that the rest is pendent, and deeply imbedded in the soil. It is a line or more in length, oblong, obtuse at the base, of a carnosous substance, though, when viewed under a high magnifying power, evidently cellular: its exterior is covered with rather long but not thickly-placed hairs (f. 9), pointing upwards.

Germen (f. 7) ovate, tipped with a thick style, and bearing upon various parts of its surface barren pistilla, which are of an oblong form (f. 8), transversely and longitudinally striated.

Corolla (f. 10), when arrived at its full size, occupying the whole width of the calyx, and reaching to about half its length; its form is ovate; its *texture* delicate and membranous.

FOOTSTALK about an inch or an inch and half long, slender, whitish, cellulose; at its base inserted into its receptacle by means of a small bulb (f. 11).

Capsule (f. 12) linear-oblong, having the four linear valves, of which it is composed, very curiously and spirally twisted (f. 13). They unfold in some degree, but never become strait in expanding, and, after the discharge of the seeds, again become twisted and reflexed. Their *texture* is extremely beautiful. Under a high power of the microscope, longitudinal brown furrows are seen, having intermediate narrow ones (f. 14), and these are connected by transverse lines.

Seeds small, numerous, of a roundish form, and of a brownish color, as are the spiral filaments, which are, moreover, long, slender, and very closely twisted, formed of a double *helix*.

Gemmæ (f. 16) abundant upon those plants which have their apices lengthened out into almost leafless portions of the stem, at the point of which they are collected together in small sphaerical clusters, resembling those of *J. bicuspidata* and *Sphagni*. Each particle is roundish, angular, pellucid, pale green.

Numerous as are the above synonyms, I am very far from sure that I have brought together all that really belong to this species, one of the most decidedly marked in the whole Genus, yet one which appears to have been less understood than almost any other. Wherever Dillenius has committed errors, they have been copied and multiplied by succeeding writers, and we stand but little chance of having them corrected, without recourse to the original specimens of this author, which, fortunately for science, are still in existence. By an examination of these specimens, it is clear that Dillenius' figures 5 and 6, of tab. 31, are slight, and by no means unfrequent varieties of the same plant; and these have been quoted under no less than six different names! It would be neither a pleasing nor a useful task, to point out the errors of the older authors in their accounts of this species. Our countryman, Dickson, first well established it under the name of *J. Trichomanis*, and has given a tolerably good figure of it. The magnified representation of the leaf, indeed, is inaccurate, but altogether it does not merit the appellation which Mohr has applied to it, of "*pessima*." The part of the *Flora Cryptogamica Germanica*, of the last-mentioned author, containing the *Jungermannia*, I have but lately received, and I am greatly disappointed in the assistance I had hoped to have derived from it. In his character of the species, which forms the subject of the present description, he has left unnoticed every thing that concerns the fructification; in his diagnosis he has compared it with *J. pallescens* (*J. polyanthos*, Linn.), with which it has little in common; he has referred to Dillenius' (though doubtingly), tab. 69. f. 2. (our *J. minuta*), as a variety; and he has brought Dickson's *J. serpyllifolia* to it as a synonym, than which nothing can be more unlike in all the essential characters.

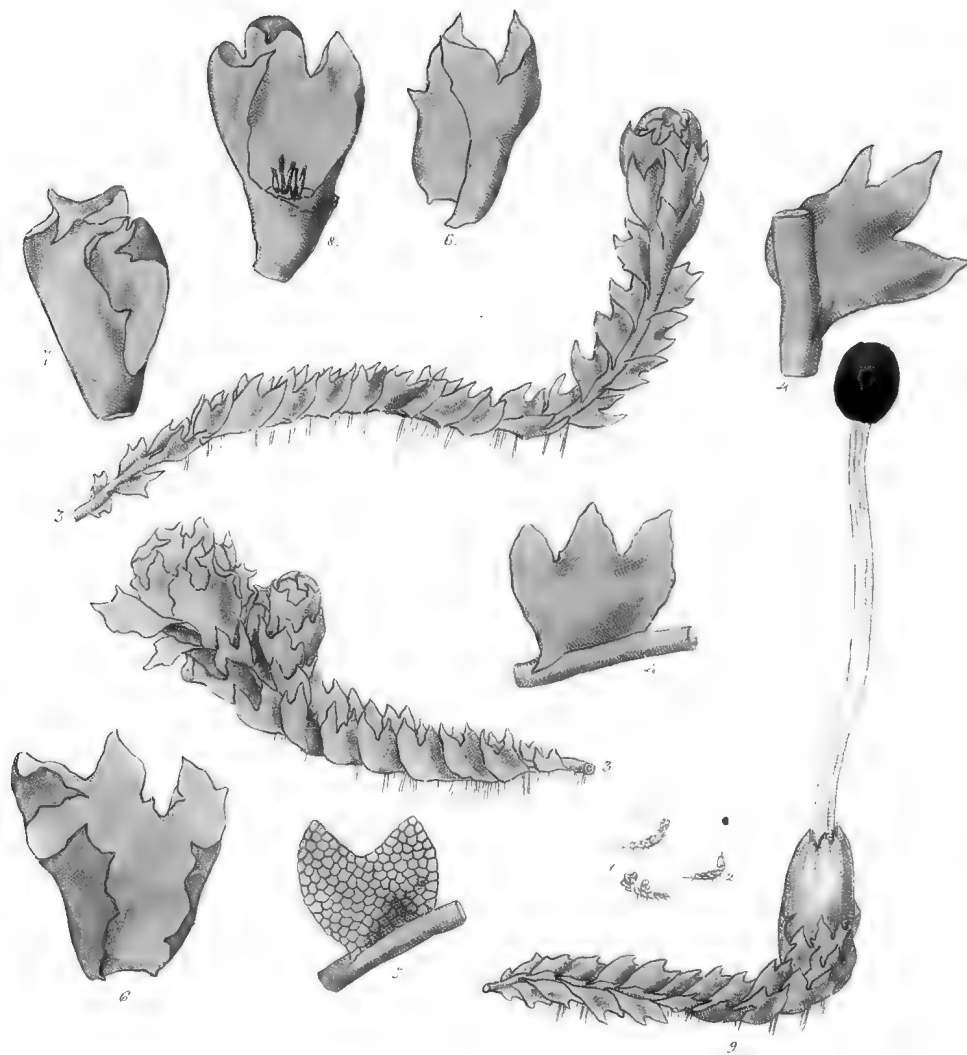
Wahlenberg, with great propriety, observes, in his valuable *Flora Lapponica*, "*Stipularum forma omninò ut in J. cavifolia* (our *J. serpyllifolia*) *Ehrh. sed folia diversissima, revera ovata et semper duplo majora, eximie hyalina et glaucescentia; quâ notâ habituali faciliè a plerisque affinibus discernitur. Defectus strumæ foliorum certissimum characterem præbet. Capsulæ insignitè oblongatæ.*" p. 387. He is equally correct, when he says that the figure in *English Botany* "*stipulas bicuspidatas exhibet.*"

I have already had occasion to notice, under *J. viticulosa*, the peculiarities which this species has in common with that; and, at the same time, I pointed out the characters that distinguished them, which, indeed, are sufficiently apparent, even to those who are not very conversant with the Genus. The hairy calyx, and twisted capsule, are very remarkable, and circumstances which I believe are confined to the present plant. Anthers are at present unknown. The heads of *Gemmæ* are born on elongated, nearly leafless portions of the stem, exactly as in *J. bicuspidata*, and, like that plant, too, the texture of the leaves and stipules is very delicate.

REFERENCES TO THE PLATE.

FIG.

1. Female plants, natural size.	
2. Gemmiferous plant, ditto.	
3. Female plants, magnified	6
4. Gemmiferous plant	6
5. Portion of the stem and leaves, seen from the underside, shewing the roots and stipules	4
6. Stipule	3
7. Calyx dissected, shewing the germen and barren pistilla	3
8. Barren pistillum	1
9. Calyx, exterior of	3
10. The same dissected, to shew the full-grown corolla occupying the whole width of the calyx, and the receptacle of the peduncle	3
11. Base of the peduncle, with its bulb	3
12. Capsule about to burst	2
13. A valve, after the capsule has burst	2
14. Portion of a valve, shewing its structure	1
15. Seeds and spiral filaments	1
16. Gemmæ	1



Jungermannia capitata !

L. 20210 exciso (L. 20210) Dum

BRITISH JUNGERMANNIÆ.

(*J. capitata*.)

JUNGERMANNIA CAPITATA.

(TAB. LXXX.)

JUNGERMANNIA, caule prostrato, simpliciusculo; foliis rotundato-quadratis, inferioribus bifidis, reliquis tri-quadrifidis: fructu terminali; calycibus oblongo-ovatis, subplicatis; ore contracto, dentato.

HAB. Cadnam Bog, New Forest, Hants, and Lyndhurst Race-course, in the same county.

Mr. Lyell.—On a rock in a dry mountainous situation near Bantry, Ireland. *Miss Hutchins.*

PLANT growing in very small pale-green patches, on a turfy soil, and having much the general appearance of small tufts of *J. incisa*.

Roots rather numerous, proceeding from nearly the whole length of the underside of the stem, pellucid, simple, fibrous.

Stems a quarter of an inch or rarely half an inch long, rather stout in proportion to their length, almost always simple (in one or two instances, only, I have observed a solitary lateral shoot, f. 1): the *color* greenish, sometimes, but especially towards the base, dingy brown: the *texture* remarkably fragile.

Leaves rather closely ranged in two rows, sometimes patent or nearly horizontal, at other times, and generally (f. 3) nearly erect, of a roundish figure, approaching to quadrate; those at the base smallest and simply bifid, whilst the rest gradually increase in size as they approach the extremity, and are both trifid and quadrifid; the segments unequal, a little waved and acute. At the very apex, particularly of the sterile shoots, the leaves are collected into a head or cluster, whence the specific name. Their *texture* is delicate, and the *cellules* large in proportion to the size of the plant, of a roundish shape, or often, as *Mr. Lyell* remarks, truly hexangular. Their *color* is rather a pale yellow-green.

Perichætal leaves large, with four or five, very unequal, incurved segments (f. f. 7. 8).

MALE FRUCTIFICATION unknown.

FEMALE FRUCTIFICATION terminal.

Calyx large for so small a plant, oblongo-ovate, greenish, a little diaphanous towards the extremity, and plicate; at the mouth somewhat contracted, and very unequally toothed.

Peduncle a quarter of a line long, white, cellulose, a little waved.

(*J. capitata*.)

BRITISH JUNGERMANNIÆ.

Capsule ovate, dark brown, splitting into four equal valves.

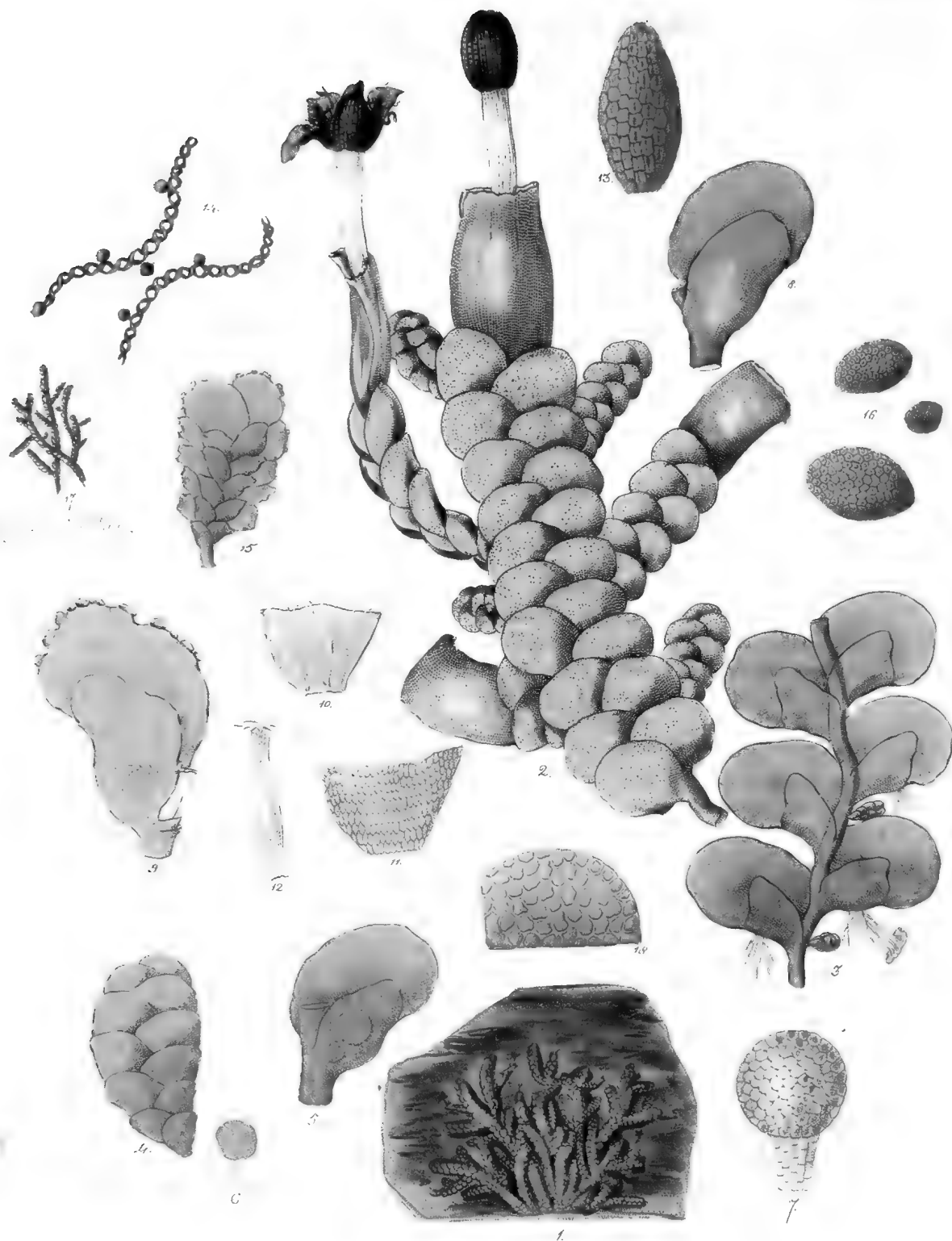
Seeds and *spiral filaments* fulvous, the latter composed of a double *helix*, attenuated at each extremity.

It is not easy, in a specific character, to define the differences which will keep this plant separate from *J. excisa*. In the fructification, and in the form and size of many of the leaves, they seem perfectly to accord; but in all the specimens I have examined, both from Ireland and the New Forest, the upper leaves of *J. capitata* are collected into a tuft or head, which gives the plant a very remarkable appearance: these terminal leaves, too, and most of those not inserted near the base of the plant, are either trifid or quadrifid, and the segments are very irregular; but, what is more striking, the texture of the leaves is delicate, fragile, and composed of cellules as large as those of *J. bicuspidata*. In this particular it differs essentially from *J. incisa*, which has similar tufts of leaves at the extremity of the shoots; but they are never, in our plant, toothed or jagged at the margins of the segments.

REFERENCES TO THE PLATE.

FIG.

- | | |
|-------------------------------------------------------------------------------------|---|
| 1. Sterile plants of <i>J. capitata</i> , natural size. | |
| 2. Female plant, natural size. | |
| 3. Sterile plant, magnified | 6 |
| 4. Cauline leaves | 3 |
| 5. Cauline leaf, shewing the cellules | 3 |
| 6. Terminal leaves | 3 |
| 7. Perichæatial leaf | 3 |
| 8. Perichæatial leaf, with pistilla appearing before the formation of the calyx.... | 3 |
-



Jungermannia complanata.
Radium complanata 17. 18.

JUNGERMANNIA COMPLANATA.

(TAB. LXXXI.)

JUNGERMANNIA, surculo repente, vagè ramoso: foliis distichis, supernè imbricatis, inæqualitèr lobatis; superioribus majoribus, orbiculatis; inferioribus ovatis, appressis, planis: stipulis nullis: fructu terminali; calycibus oblongis, compressis, truncatis.

α . MAJOR; foliis planiusculis, pallidè viridibus.

Jungermannia complanata. LINN. *Syst. Nat.* II. p. 706. *Sp. Pl.* p. 1133. *Fl. Suec.* p. 922. TIMM. *Prodr. Fl. Megap.* n. 868. *Fl. Dan.* t. 1062. CRANTZ, *Inst.* p. 64. SCOP. *Carn.* II. p. 345. NECK. *Meth.* p. 142. WEIS, *Crypt.* p. 124. WEBER, *Spic. Fl. Goet.* p. 146. VILLARS, *Delph.* IV. p. 925. LAM. *Dict.* III. p. 282. HUDS. *Angl. ed.* 2. II. p. 514. WITH. *Bot. ed.* 5. III. p. 1073. LIGHTF. *Scot.* p. 780. HULL, *Br. Fl.* p. 280. RELH. *Cant.* p. 418. SIBTH. *Ox.* p. 311. GOUAN. *Monsp.* p. 452. CURT. *Lond. ed.* 1. HOOK. in CURT. *Lond. ed.* 2. EHRH. *Crypt. fasc.* 97. WEB. et MOHR, *Crypt. Germ.* p. 416. WAHL. *Lapp.* p. 390. *Engl. Bot.* t. 2499. LAM. *Fl. Fr. ed.* 3. II. p. 434. LAM. *Syn. Fl. Gall.* p. 93. HOFFM. *Germ.* II. p. 35. ROTH, *Germ.* III. p. 403.

Lichen parvus in corticibus arborum humidis repens, foliolis subrotundis, squamatim incumbentibus. RAII *Syn.* II. p. 41. *Hist.* p. 48.

Jungermannia foliis subrotundis, densissime et imbricatim dispositis, viridis major. RUPP. *Jen.* I. p. 345. II. p. 294.

Lichenastrum petalodes squamosum, majus. Cat. Giss. p. 213. App. p. 84. t. 1. f. D. E. F. Ic. Fl.

Lichenastrum imbricatum majus. Cat. Gis. Suppl. p. 172. 174. t. 16.

Jungermannia foliis circinnatis auritis imbricatim dispositis ex viridi flavescentibus. MICH. *Nov. Gen. Pl.* p. 7. t. 5. f. 21.

Lichenastrum imbricatum, majus, squamis compressis et planis. DILL. *Musc.* p. 496. t. 72. f. 26.

Jungermannia foliis rotundatis, alterne imbricatis, caule plano multifloro, setis brevissimis.

HALL. *Helv.* III. n. 1860.

Hepaticoides foliis et surculis Thuyæ instar compressis major. VAILL. *Bot. Par.* t. 19. f. 9.

β . MINOR; foliis convexioribus, fusco-lutescentibus.

HAB. Abundant on the trunks of trees, and there rendered conspicuous by its pale-green color; bearing fructification all the year.— β was found in Ireland, near Bantry, by Miss Hutchins.

(*J. complanata*.)

BRITISH JUNGERMANNIÆ.

PLANTS densely imbricated, so as to form wide but compressed tufts, or cushion-like patches.

Roots proceeding rarely from the lower side of the stem, more frequently from the leaves, always in small pencil-like tufts, consisting of pellucid, simple fibres (f. 3).

Stems, or *Surculi*, from an inch and a half to two inches or more in length, creeping, flexuose, variously branched, the branches again divided in a pinnated manner, and here and there producing innovations. *Color* green.

Leaves closely imbricated over the upper surface of the stem, and in a bifarious manner, unequally two-lobed, the *superior lobe* much the largest, orbicular, nearly flat upon the upper side (in β convex); the *inferior lobe* ovate, appressed, flat, and often shooting forth roots. The *color* is a very pale yellow-green; in β alone yellow-brown. The *substance* is delicate and flaccid; the *reticulation* small and obscure (f. 18).

Perigonial leaves (f. 5) similar to the rest, but more ventricose at the base, where the *Anthers* are situated.

Perichæatial leaves also but little differing from the cauline ones, except in having the two lobes more equal in size (f. f. 8. 9).

Stipules none.

MALE FRUCTIFICATION situated in the axillæ of young lateral shoots (f. f. 2. 4).

Anthers two or three in the axilla of each leaf, globose, reticulated, yellowish, supported on cellular, whitish, short footstalks (f. f. 6. 7).

FEMALE FRUCTIFICATION terminal upon the branches, and on the lateral shoots (f. 2).

Calyx oblong, from a cylindrical base becoming wider, compressed, and at the extremity quite flat, incurved before the putting forth of the capsule; the apex truncate, nearly entire, or only a little cleft on one side. (In a very young state (f. 9) the *calyx* is shorter and wider than that just described (f. f. 11. 12), but still very much compressed.)

Pistilla five to seven in each calyx, oblong, slightly swelling towards the base, at the mouth expanded and toothed, or radiated (f. 12), of a pale and almost white *color*, faintly striated transversely and longitudinally.

Calyptra pyriform, whitish, pellucid, reticulated, tipped with a short *style*.

Peduncle not more than twice the length of the calyx, white, succulent, cellulose.

Capsule ovate, pale brown, transversely and longitudinally furrowed (f. 13).

Seeds rather large, spherical, brown, as well as the *spiral filaments*, which are formed of a double *helix*.

Gemmæ are attached to the margins of the leaves in the spring months (f. f. 9. 15), and are of various sizes, of a roundish or ovate figure (f. 16), compressed, evidently reticulated, so as to resemble in texture the leaves.

Jungermannia complanata is a species but little subject to variation, nor have I seen any appearance of it sufficiently unlike the common to be worth mentioning, except the small brown one found on rocks in Ireland, by *Miss Hutchins*, and described above, and represented at f. 17.

Although, in general habit, evidently allied to that beautiful family to which *J. Tamarisci*, *J. dilatata*, *J. platyphylla*, &c., belong, the plant before us is, nevertheless, abundantly distinguished from them by a total want of stipules; of which part Dr. Roth has, notwithstanding, maintained

BRITISH JUNGERMANNIÆ.

(*J. complanata*.)

the presence, and has given a particular description of them: his words on the subject are, "Quamvis Pollich, Scopoli, et Weber stipularum præsentiam negent, tamen revera adsunt, at ægrius et caule luci obverso sub lente bene augente ritè tantùm distinguendæ. Ad latera scilicet caulis nervi intra folia densissimè imbricata egrediuntur in aversâ paginâ foliisque adprimuntur, structura et figura cum illis exactè convenientes, licet duplo minores:" from all which, it appears that he has taken the smaller lobe of the leaf for stipules.

The circumstance of roots proceeding from the leaves is highly curious, and Wahlenberg, I believe, was the first to observe it. We know that the leaves of some mosses (*Hookera lucens* for example) have the property of throwing out roots, but in them it takes place at the margin of the leaves; here from the surface or pagina, and generally from that part which forms the fold between the smaller and the larger lobe. I have reason to think that *J. dilatata* and *J. Tamarisci* possess the same property, and that the small spherules I have figured on the stems and leaves of the former of these species (tab. 5), are the young roots; and the more so, since I have seen the following remark of Wahlenberg: Alluding to the leaves of *J. complanata*, he says, "In ejus paginâ inferiore versus oram inferiorem papilla protuberat, primum viridis, dein fuscescens et radicans."

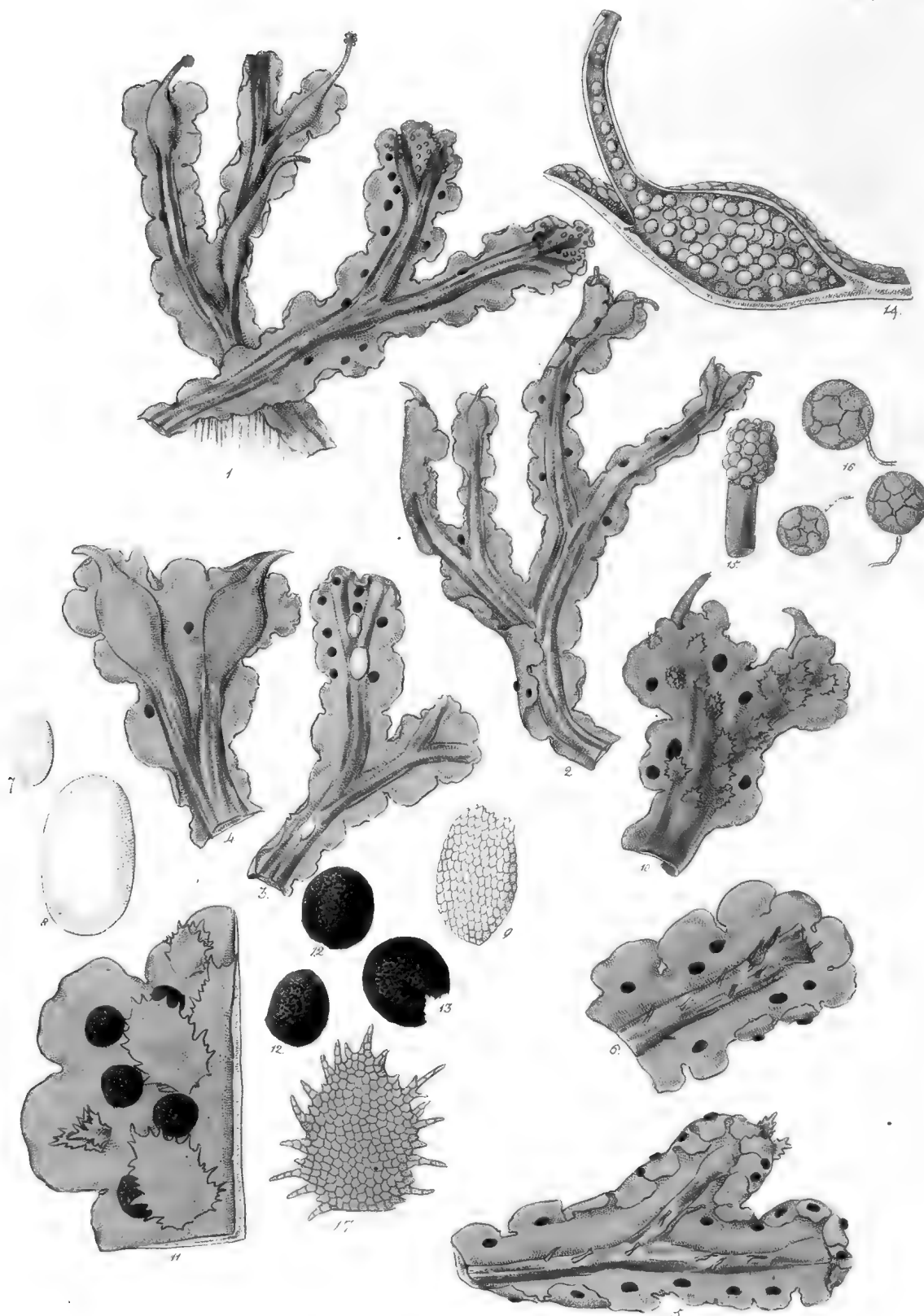
Nor are the Gemmæ less worthy of observation. They have the most complete analogy with the Gemmæ of the *Marchantia*, and with those of *J. farcata*; being, like them, evidently cellular; and they are seen to increase in size before they are detached from the plant. Totally different are they in their nature from the Gemmæ of *J. bicuspidata*, *J. ventricosa*, &c.

In point of calyces, *J. complanata* resembles *J. undulata*, which, notwithstanding the different mode of growth and habit, as it appears at first sight, ought, perhaps, to rank in the same family with that species. There is this striking difference between them, that, in the family in question, the lobules cover the upper or anterior surface of the stem, in *J. complanata* the lower. Such is the case, too, in *J. cochleariformis*, where the lobule is, however, formed into a kind of sack.

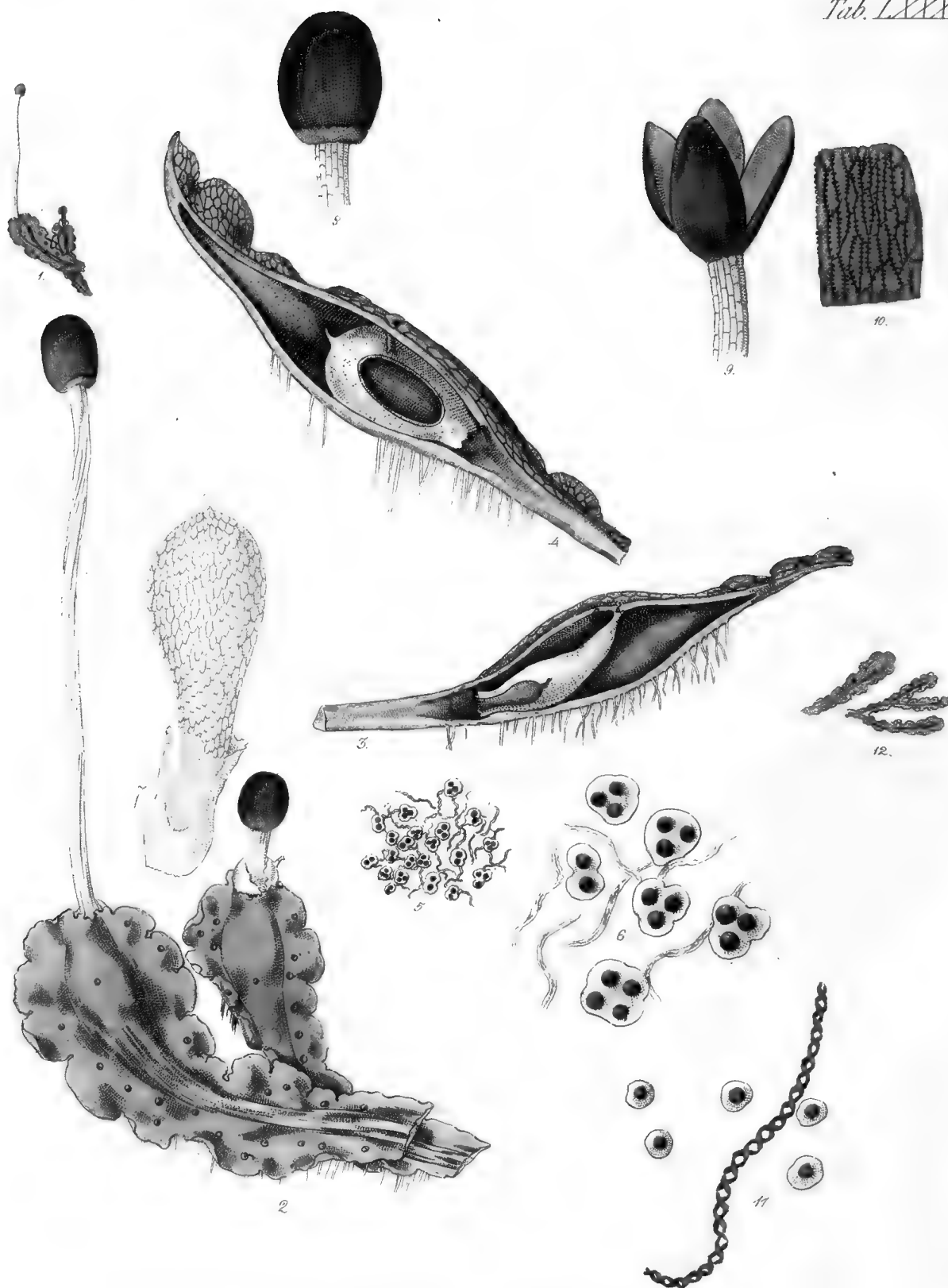
REFERENCES TO THE PLATE.

FIG.

1. <i>J. complanata</i> , natural size.	
2. Portion of the same, magnified	6
3. Stem and leaves seen from beneath, to shew the lobules and roots	4
4. Antheriferous shoot	5
5. Perigonial leaf, with its anther	3
6. Anther	3
7. The same	1
8. Perichætial leaf	3
9. Perichætial leaf with gemmæ, and containing a young calyx	3
10. Young calyx, with pistilla	2
11. Calyx, shewing its reticulations	1
12. Pistillum	1
13. Segment of the capsule	1
14. Seeds and spiral filaments	1
15. Young female shoot, having gemmæ on its leaves	6
16. Gemmæ	1
17. Var. β , natural size.	



Jungermannia *Blasia*?
Blasia pusilla L.



Jungermannia Blasiali!
Blasia pusilla L.



Jungermannia Blaseni
Blaseni I.

BRITISH JUNGERMANNIÆ.

(*J. Blasia.*)

JUNGERMANNIA BLASIA.

(TAB. LXXXII. LXXXIII. LXXXIV.)

JUNGERMANNIA, fronde oblongâ, ramosâ, costatâ, infrâ squamis dentatis sparsis instructâ; margine lobato; fructu e superiore parte costæ egrediente; calyce calyptrâque intrafrondosis.

Blasia pusilla. LINN. *Fl. Suec.* ed. 1. p. 933. ed. 2. p. 405. *Sp. Pl.* p. 1605. *Syst. Nat.* p. 707. TIMM. *Prodr. Fl. Megap.* n. 886. CRANTZ. *Inst.* p. 61. t. 1. LUDW. *defin. Pl.* p. 293. WEBER, *Spic. Fl. Goet.* p. 169. HOFFM. *Germ.* II. p. 94. t. 3. HUDS. *Angl.* p. 519. WITH. *Bot. Arr.* ed. 4. III. p. 868. HULL. *Brit. Bot.* p. 283. LIGHTF. *Scot.* p. 1112. CED. *Fl. Dan.* t. 45. *Engl. Bot.* t. 1328. STURM, *Deutsch. Fl. Ic.* MOHR, *Fl. Crypt. Germ.* p. 437. SCHMID. *Diss. de Blasia, cum Ic.* HEDW. *Theor. Pl. Crypt.* p. 112. t. 28. f. 156 to 164. LAMARCK, *Dict.* I. p. 429. *Illustr.* t. 877. LAM. *Fl. Fr.* ed. 3. II. p. 418. LAM. *Fl. Gall. Syn.* p. 90. WAHL. *Lapp.* p. 899. SCHWAEGER, *Musc. Hep. Prodr.* p. 36. *Blasia pusilla, Lichenis pyxidati facie.* MICH. *Nov. Gen. Pl.* p. 14. t. 7. *Mnium Lichenis facie.* DILL. *Hist. Musc.* p. 237. f. 31. *Blasia fronde lobata, lobis subrotundis, nervis setiferis.* HALL. *Helv.* t. 3. p. 57.

HAB. By no means uncommon in the alpine and mountainous parts of England, Scotland, and Ireland: generally preferring moist heaths, or sandy ground, which is occasionally inundated.—(It bears *capsules* in the spring months: *Gemmæ* are found throughout the whole year.)

PLANT growing in patches of various dimensions; the individuals separate, or, as is frequently the case, imbricating one another, like the fronds of *J. pinguis* and *J. epiphylla*.

Roots more or less numerous, and crowded on different plants, and even on different parts of the same plant, yet frequently extending the whole length of the underside of the nerve, from which alone they originate: they are simple, fibrous, pellucid, whitish.

Frond lying horizontally upon the ground, yet with the apices often erect, from a quarter of an inch to an inch in length, varying remarkably in figure, for the most part oblong, sometimes simple, or with a single lateral short branch (tab. 84. f. f. 6. 7. and tab. 83. f. f. 2. 12); sometimes more divided, and in a dichotomous manner (tab. 82. f. 2); at other times the ramification seems to be almost palmate (tab. 84. f. 1), having the ends forked: it is to

(*J. Blasia.*)

BRITISH JUNGERMANNIÆ.

be observed, that the extremities of the plant, and of the branch itself, are always wider than their base; their width, in the first case, being two or even three lines; in the other, seldom exceeding a line and a half. It is of more rare occurrence that the frond, from a common centre, is branched in a stellated sort of manner: such an appearance is represented at tab. 84. f. 9, where the apices have also a slight disposition to be forked.

The *substance* of the frond is between carnose and membranaceous, thinnest at the margin, where it is often slightly waved, and cut into deep and obtuse lobes of various sizes, but all of them large, at first sight giving the appearance of closely set, pinnated leaves; but the divisions never reach so far down as the nerve. These lobes are, moreover, often incurved, and particularly so towards the extremity of the plant (tab. 82. f. 2). The whole is cellulose, and the cells tolerably large, presenting, on the exterior surface, a beautifully reticulated appearance, with ovate areolæ (tab. 83. f. f. 3. 4).

Throughout the centre of the frond, and following the divisions of the branches to their very extremity, runs a very evident and broad *nerve*, most prominent on the underside, and marked on the upper side with numerous lines, as if the epidermis lay in plaits or folds (tab. 82. f. f. 1. 2, &c.). Sometimes it happens that the nerve is forked within the extremity of a simple branch, where probably the frond is about to be extended in a dichotomous manner, as I have already noticed in *J. furcata* (tab. 82. f. 1).

The *color* of the whole plant is a pale-green, but that of the nerve usually paler than the frond; except when the plant is dry: the base is often yellow-brown, as if in a state of decay.

On the underside of this species, always upon the nerve, and closely appressed to it, are scattered, apparently at unequal distances, small *stipulaceous scales*, of an oval form, flattish (tab. 82. f. f. 10. 11), and deeply, though unequally, spinoso-dentate. These *scales* must be carefully distinguished from the gemmaceous buds or tufts, found not only on the upper, but likewise on the underside of the plant: but they are not confined to the nerve, nor are they ever single or appressed to the frond.

MALE FRUCTIFICATION, as far as I have yet observed, upon different individuals from the Female. (tab. 82. f. 3.)

Anthers two or three in the same frond, constantly imbedded in the nerve; covered, however, only with a very thin cuticle, and always visible, not only by the different color, but also by a slight swelling of the nerve where they are situated (tab. 82. f. 3). Their figure is elliptical, or nearly ovate: their color pale greyish. I have not been able to perceive any point of attachment to the cell of the frond, in which they are imbedded. It requires a highly-magnifying power to discover the reticulated appearance of the anther (tab. 82. f. 9). Within they are filled with an extremely minute, granulated substance.

FEMALE FRUCTIFICATION arising from the upper side of the frond, and towards the extremity.

The earliest state that I have observed of it is represented at tab. 82. f. f. 5. 6. and tab. 84. f. 4.

In the first of these plates are figured young *pistilla* quite exposed, scattered at various distances upon the nerve, each of which is nearly linear, but a little swelling at the base, and slightly expanded at the apex, of a greyish color, and striated longitudinally with pale-red, and marked also with a few transverse lines. Another state of the early fructification is given at tab. 84. f. 4, where the *pistilla* are represented, equally free from any calyx or external covering, collected into small clusters, as they are within a perichætium in every other *Jungermannia* that we are acquainted with (*J. Hookeri* alone

excepted). These, too, are upon the nerve. In the midst of one of these clusters, I found a single *pistillum* swollen into a germen (tab. 84. f. 5) of an ovato-lanceolate form, and of a greyish-brown color, and tipped with a rather large and perforated style.

It might be expected that, in a similar situation, the germen would be seen in a more advanced state; but this I could never observe to be the case: on the contrary, the progress of the fructification seems to be altogether internal. I have not been able to find an external germen more swollen than that above described; but in innumerable instances, on dissecting fronds, such as are figured at tab. 83. f. 12,* having an oval inflation on the frond, with a slight depression and scar, or umbilicus, in the centre, I have never failed to see the germen in different states of advancement towards maturity; and this will be better understood, by a reference to tab. 83. f. f. 3. 4. The upper individual, at f. 12, being dissected longitudinally, and exposed to the microscope, shewed an oblong hollow beneath the inflation above mentioned (tab. 83. f. 3); and within it was a calyx extending from the umbilical mark or cicatrice down to the lower extremity of the hollow or receptacle.

This *calyx* is of an oblongo-lanceolate and acuminate figure, closed at the top, bladder-like, whitish, membranous, scarcely reticulated, semitransparent, so that within is seen the *Germen*, already so much swollen as to be of a pyriform figure, tipped with a short, curved style, and of an olive-green color: at the base it is inserted into the receptacle by means of a small bulb. In its progress towards maturity, its increasing size causes the calyx to burst, and portions of it remain attached to the umbilicus (tab. 83. f. 4), and at the bottom of the germen on the receptacle (tab. 83. f. 7). The *Germen* is now become of an oblongo-ovate figure, and the reticulated appearance of the outer covering or calyptra is very striking. Advancing still more, the fructification bursts open the upper surface of the frond, in a very irregular manner, always above the inflation, and nearly at the apex of the frond (tab. 32. f. 2).

Calyptra, even when about to burst, scarcely exserted above the aperture of the frond, sometimes not at all so, in which case the opening is formed by the capsule.

Peduncle white, succulent, from half an inch to an inch long, erect, but waved, striated, and somewhat twisted.

Capsule ovato-globose, whitish at the base, the rest pale olive-brown. It opens into four equal, ovate valves, whose texture is, under the microscope, beautifully reticulated, and the borders of the areolæ have a dotted appearance (tab. 83. f. 10).

Seeds: these, if removed from the fully formed germen or young capsule, are roundish, of an olive-green color, enveloped in a pellucid membrane, and lying together† in threes; though sometimes only two, and rarely four are found in a cluster (tab. 83. f. f. 5. 6). In this state of the fructification, too, the *filaments* are most evidently likewise surrounded by a pellucid tube. The ripe seeds fall from the capsule singly (tab. 83. f. 11), but are still within a membrane, and do not differ from the young seeds, except in being of a darker color. I can perceive no tubular membrane about the fully formed *spiral filaments*, which are rather long, closely twisted, and formed of a double *helix*.

* And the same appearance is represented highly magnified, on the fronds, at tab. 83. f. 2, although the capsules are there exserted.

† Such is the case too in *J. Hookeri*.

The *Gemmæ* of this plant are of two kinds, and highly curious from their situation, which is perfectly different from that in every other species of the genus yet known, and deserving of very particular description.

I shall first notice those bodies which by most botanists are looked upon as the seeds, whilst their receptacle has been considered the capsule, upon the shape of which, principally, the character of the genus *Blasia* has been established! This *receptacle* is found plentifully in the spring and summer months; one, or rarely two, upon each segment of a frond, always towards the extremity, and always upon the nerve. This, in an early stage, forms a swelling of an ovate figure, or even ventricose; at the upper extremity furnished with a beak, at first short, acuminate, and closed (tab. 82. f. f. 4. 10), at length becoming lengthened out, cylindrical and hollow throughout (tab. 82. f. f. 1. 14). A section of this (tab. 82. f. 14) discovers numerous spherical small bodies, enveloped in a perfectly transparent gelatinous mass, and apparently floating in it. Each of these is cellular, reticulated, the *cells* of very unequal sizes (tab. 82. f. 16), furnished with a minute radicle, even before they are discharged from the receptacle. This discharge takes place through the tube, and does so the more readily in dry weather, when the fronds collapse, and force the *gemmæ* towards the mouth, where they are often collected into a capitulum by means of the gelatine.

On the dispersion of these *Gemmæ*, they fall not only on the ground in great number, but on the fronds themselves, where they, sooner or later, according to the fineness of the season, develop themselves, becoming tufts of small green scales, scattered over the apices of the frond, where they are retained by means of the incurved margins (tab. 84. f. f. 1. 2. 4). Their appearance is totally unlike the perfect plant; being of an ovate figure, dentatospinose, three or four collected together, and resting on their base, which, however, does not seem to have any point of attachment to the frond; for they are removed by the slightest touch. These, it may be supposed, are expanded in an advanced state of their growth; the scales taking a different form, and the teeth becoming dilated into lobes*. The similarity between these scales and those of the under side of the frond is very considerable; but their difference has been already explained.

The second kind of *Gemmæ* is situated on the under side of the frond, but never on the nerve. These appear in the form of small, roundish, dark-green dots, within the substance of the plant; but evidently nearer the lower epidermis than the upper, though visible on both sides, on account of their deep color. As they grow older, they become prominent, and form tubercles (tab. 82. f. f. 4. 6. and tab. 84. f. 2) on the under side of the frond; yet always continue covered with a slight pellicle, out of which, if the swelling be opened with the point of a knife, the *gemmæ* readily fall, and are then seen to be spherical masses, of a substance between granular and pulpy, almost black, compact, but quite free from any membranaceous covering like the true anthers; nor are they at all cellular, like the *gemmæ* just described.

Although, for want of a better term, I have applied the name of *Gemmæ* to these bodies, I am far from supposing that these apparently unorganized granules have the same

* That these young fronds should be so unlike the old ones is not so remarkable, when we consider the different appearance of many seedling cryptogamous plants from perfect ones, particularly the Ferns.

BRITISH JUNGERMANNIÆ.

(*J. Blasia.*)

functions assigned to them as those contained in the receptacles, to which the same appellation is here given, and which, I think, are clearly ascertained to become new plants, like the receptacular gemmæ of the *Marchantiæ*, and like those gemmæ that I have described on *J. complanata*, *J. calyptrifolia*, *J. furcata*, and others; whilst bodies, analogous to the gemmæ in question, may be found in what I have in this work called Gemmæ of *J. bicuspidata*, *J. nemorosa*, &c. (See, upon this subject, a remark under *J. calyptrifolia*.)

Having now devoted three entire plates, and an equally unusual portion of letter-press, for the description and illustration of the present species, little remains for me to add in the diagnosis, which can tend to a more complete knowledge of the plant; since it is my wish simply to state facts as I have seen them, and to avoid every discussion respecting the offices of the respective parts of the fructification. I feel sensibly, that the further I advance in my acquaintance with these curious little vegetables, the greater are the difficulties which arise in the determination of the sexual organs; and I will, for the present, beg to declare myself neither the partizan of the Hedwigan system, which, ingenious as it is, appears to be fraught with many difficulties, nor of that of Richard, one of the most learned botanists of the present age; whose theory of "AGAMES," as he calls the Cryptogamia of Linnæus, I am far from understanding as I would wish to do, although I see sufficient to be convinced that it is highly worthy of attentive consideration. I shall content myself with remarking, what I think no one will deny, that, if what, in conformity with the language of Hedwig, have here been called capsules and anthers in *J. epiphylla*, be really such, those bodies which are so denominated in the present species, are, with equal propriety, worthy of that denomination; since the closest analogy, in structure and situation, exists between them.

Declining then, as I do, bringing forward any arguments on the theory of the fructification in this species, it will not be necessary to enter much at large into a critical examination of the labors of Hedwig and Schmidel, in their Dissertations on the genus *Blasia*, which are professedly written with a view to ascertain what is the male, and what the female, fructification of the plant in question. Their speculations, indeed, are now completely overturned, by the discovery of what they themselves would undoubtedly acknowledge to be the true capsules.

I cannot, however, omit adding a few words on the genus *Blasia*, which must, in future, be erased from the Flora. It was established by Micheli, who says of it, "Hanc novam plantam jure quidem optimo Blasiam denominavimus, a Pat. D. Blasio Biagi Congregationis Vallis-Umbrosæ Monacho, Botanico non gregario, ac in Etruscis itineribus nostris ad indagandas plantas sæpe sedulo comite." The character he has defined to be "Plantæ genus, flore monopetalo, campaniformi, tubulato, elephantinam proboscidem quadamtenus æmulante, sed sterili, et calycè carente. Fructus verò sunt capsulæ secus foliorum margines, in quibus decem, ut plurimum minima rotunda nidulantur semina." A figure* is likewise added at tab. 7, but a very inferior one, compared with that given by Dillenius, in his incomparable *Historia Muscorum*. This latter admirably represents, though of the natural size, the tubular receptacles, the marginal gemmæ, and the

* This figure, though tolerably good for the time in which it was published, is yet far from conveying a correct idea of the plant. The lobes of the frond are not expressed; the marginal gemmæ are inaccurate; and the receptacles of the gemmæ are too large, and the mouth too much expanded.

(*J. Blasia.*)

BRITISH JUNGERMANNIÆ.

tufts at the extremity of the frond. The author, however, makes it a *Mnium*, "*Mnium Lichenis facie*," from the supposition that the capitula, at the extremity of the tubular receptacle, had their origin there; whereas it is only in a certain state of the plant that these gemmiferous receptacles put on the appearance of the granular heads of a *Mnium*. Nor is the description, partly made by Dillenius himself, and partly by Mr. William Harrison, who first found the plant in England, near Manchester, as far as it goes, at all less worthy of praise than the figure.

Linnaeus described our plant under the name of *Blasia pusilla*, in his *Flora Suecica*, it having been found in ditches near Fahlun; and Oeder has figured it in the *Flora Danica*; but neither of these authors have entered into any satisfactory description of it. The former seems to consider the gemmæ, within the tubular receptacles, as seeds; since he says, "*Semina matura e suo cyathofere cylindrico defluunt, tam parva ut eorum figura nudis oculis distingui nequeat*;" yet, in the *Systema Naturæ*, his character of the genus is,

MASC.? *Cal. cylindricus granis repletus.*

FEM.? *Cal. nudus. Fructu subrotundo, foliis immerso, polyspermo.*

So that Sir James Smith is not correct, when he says that the black sessile warts, scattered over the frond, are universally allowed to be male flowers. He has equally overlooked the passage in Micheli, "*Fructus sunt capsulæ secus foliorum margines*."

It is to the admirable Dissertation of Schmidel, above quoted, that we must look for a complete description of this curious plant, from its earliest stage of growth, to its arrival at maturity, together with its mode of increase by gemmæ; for heretofore no one has ever discovered the anthers any more than the capsules. Besides saying all that can be said concerning the two different kinds of gemmæ, the author, in the thirteenth section, describes what he considers a third organ of propagation peculiar to this plant; but this, from all I can understand of the description, appears to be nothing more than a repetition of the mode of increase by the gemmæ, which have fallen from the tubular receptacles, and are dispersed alike upon individuals, furnished with receptacles themselves, and upon such as have them not. Nor do the figures he has given of these parts induce me to think otherwise upon the point; although I must confess, that, with regard to most of the magnified figures on the plate, they do not seem to me to deserve that praise which has been so universally bestowed upon them, and which those of the natural size doubtless merit.

At the conclusion of his elaborate history, Schmidel sums up his account of the genus in these words: "*BLASIA est ALGÆ genus pro flore masculino gerens Antheras solitarias, per frondis substantiam sparsas, sessiles, subglobulosas: pro femineo fere Calycem monophyllum, inverse ovatum (extrorsum) tubulatum, tubo subcylindræo truncato; absque Corolla; et ex fundo Calicis Semina nuda, libera, plurima, subrotunda, compressiuscula excludens*."

Hedwig comes next to be considered; who, having, as may be expected, added little that is new to what has been observed by the last-mentioned author, assures us, that what he has offered to the reader is done chiefly with a view to confirm and illustrate the discoveries of the incomparable Schmidel. He therefore, likewise, looks upon the marginal gemmæ as anthers, and the receptacular ones as seeds, saying of the former, what I have not myself been able to verify, that the *folliculus* of the anther "*extrinsecus fibrillosus * est, evidenti judicio communicationis cum plantulæ vasculis*."

* Let me add, however, in confirmation of Hedwig's assertion, a communication made to me by Mr. Lyell. "In two specimens, these tubercles are rough and unpolished, as if they had burst, and when I threw a ray of sun-shine on them, seemed covered (not thickly) with very short, white filaments." *Lett. Dec.* 1812.

BRITISH JUNGERMANNIÆ.

(*J. Blasia.*)

Of the tubular receptacles of the gemmæ (which, by the bye, are extremely ill done in the *Theoria*, where they have the appearance of being of a different texture and color from the rest of the plant), Hedwig remarks, “*parum de truncelli extremitate, elevatori fructus rudimento superius insidet exiguus tenerrimus stylus fuscus coloris ab omnibus disquisitoribus prætervisus: neque mirum, cum admodum fugax sit.*” Yet neither does the figure alluded to exhibit any appearance of the supposed style being of a different color from the rest of the receptacle, nor does it ever appear so in reality. The same author aptly compares this style-like body, in a more advanced state, to the calyx of *Anthoceros*; and, with regard to Schmidel's *third* mode of fructification, I am happy to say he entertains the same opinion with myself. I must not omit to notice, that it is to Hedwig we owe our first acquaintance with the roots, or root-like appendages, that are found on the receptacular gemmæ; although, in the *Theoria*, they are figured with these appendages too large, and too much attenuated.

In the *Species Muscorum* (p. 343), the following character of the genus *Blasia* is given:

Perigonium nullum (nisi cuticulam dicas). *Calyptra* brevis, integra elevata cum *sporangio* cordato-acuminato, univalvi, per apicem maturitate pervium emittente *sporas* nudas.

Spermatocystidia orbicularia, complanata, solitaria, latitantia singula in foveolâ, epidermide tectâ.

Flores diclini.

Schreber, in his *Genera Plantarum*, has added nothing of any moment to what preceding authors had done. Hoffmann's description of *Blasia pusilla* (*Fl. Germ.* v. 2), seems to be compiled wholly from Hedwig and Schmidel. The same may be said of Roth's account of the genus: nor does the excellent Mohr give any new observations in his *Cryptogamic Flora* of Germany. Schwägrichen's character is a very imperfect one. “*Theca* univalvis. *Seminum* elateres nulli. *Calyptra* a vaginulâ secedens, dimidiata.”

Wahlenberg alone has ventured to doubt if the real seeds were known, and has, consequently, altered the generic character, which stands thus in his admirable *Flora Lapponica*:

“*Flores* dioici?”

Mas? *Sacculus* in substantiâ frondis occultus, rostello elevato eminens, apice dehiscens et granula masculina emittens.

Fem. ignoti?”

And he adds to this a remark so valuable, that I cannot forbear quoting the whole of it. “*Granula illa, quæ emittunt rostella, mihi tam similia videntur polline sic dicto masculino in Jungermanniis, vel etiam propagulis cyathorum apud Marchantiam, ut non possum quin dubitem ea esse vere semina. Semper pellucida sunt, quasi e pluribus granulis partialibus composita. Conformatio conceptaculi quoque Cyathis Marchantiæ sat analogâ, sed toto cælo a capsulis veris Marchantiarum et Anthocerotis recedens. In Marchantiâ pilosâ sic dicti flores masculini desiderantur, cur heic femineos pressius reperire volumus?*”

It would not have been in my power to have confirmed the opinion held out in the above remark, and to have illustrated my figures and descriptions of this plant with the perfect fruit, had it not been for the kind assistance of my botanical friends. Mr. Dickson first put into my hands capsuliferous specimens of the *Blasia*, which he gathered on the shores of Loch Tay, in Invernesshire, and supposed to be a new Jungermannia. These, however, I should not perhaps have readily ascertained to be the *Blasia*, had I not received other specimens about the same time, but without capsules, from Dr. Swartz, when I was instantly struck with the marginal gemmæ in both. Mr. Lyell discovered the plant at Kinnordy; and, with his accustomed zeal and industry,

(*J. Blasia.*)

BRITISH JUNGERMANNIÆ.

watched its progress so unremittingly, that I had at length the satisfaction of receiving from him specimens in the state represented at tab. 83. f. f. 3. 4. 7. 12; and had soon after, from Ambleside, the still greater pleasure of having forwarded to me, by the same friend, an individual with the capsule burst from the frond. With equal ardor Dr. Taylor commenced his researches in the neighborhood of Dublin, where he had the good fortune to find capsules fully ripe, and discharging their seed, on the mountains at Lough Bray, on the 31st of March, 1814. These he communicated to me, with the remark, that he believes the capsules to be of very short duration; "for that it was not till after repeated visits to the same spot, and a most laborious search each time upon his hands and knees, that he was at length able to discover them. The weather was remarkably warm, succeeding a shower of rain."

I have myself seen the plant in the same habitat, and likewise in various parts of England and Scotland, though it is chiefly confined to hilly or mountainous districts. In Switzerland it is very abundant; yet it was only on the Grimsel, in the autumn of 1814, that I ever saw the capsules exerted upon growing plants.

REFERENCES TO THE PLATE.

(TAB. LXXXII.)

FIG.

- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 1. Two fronds of <i>Jungermannia Blasia</i> ; the one producing marginal gemmæ }
and young tufts, the other having the receptacular gemmæ magnified .. } | 6 |
| 2. Plant much branched, with receptacular and marginal gemmæ | 6 |
| 3. Portion of a frond, bearing anthers | 6 |
| 4. Portion of a frond, with young receptacles for the gemmæ, the mouth not }
being yet opened | 4 |
| 5. 6. Portions of a frond, bearing pistilla scattered on the nerve, and shewing }
the marginal gemmæ prominent beneath. | 4 |
| 7. Anther | 3 |
| 8. Ditto | 2 |
| 9. Portion of the cuticle | 1 |
| 10. Portion of a frond, seen from beneath, shewing the scales | 4 |
| 11. Another portion of the same, with a young tuft | 3 |
| 12. Gemmæ, removed from the substance of the frond | 2 |
| 13. One of the same, broken | 1 |
| 14. Receptacle of gemmæ, dissected | 3 |
| 15. Extremity of ditto, with the gemmæ terminal | 2 |
| 16. Gemmæ | 1 |
| 17. Stipulaceous scale | 1 |

BRITISH JUNGERMANNIÆ.

(*J. Blasia*.)

REFERENCES TO THE PLATE.

(TAB. LXXXIII.)

FIG.

1. *Jungermannia Blasia*, two specimens, with perfect capsules, natural size.
2. The same, magnified 6
3. Section of a young female frond, shewing the situation of the calyx and germen 3
4. The same more advanced; the calyx being burst 3
5. Seeds and spiral filaments, removed from the germen, f. 4 2
6. The same 1
7. Germen, enveloped in the calyptra, and having a portion of the calyx at the base 2
8. Capsule, unopened 2
9. The same, with the valves burst 2
10. Portion of the valve of the capsule 1
11. Seeds and spiral filaments, from a ripe capsule 1
12. Young female fronds, natural size.

REFERENCES TO THE PLATE.

(TAB. LXXXIV.)

FIG.

1. Large branched specimen of *J. Blasia*, natural size.
2. Portion of a frond, with tufts, magnified 3
3. Tuft, magnified 1
4. Portion of a frond, with tufts and clusters of pistilla 3
5. Young germen and pistilla 1
6. Sterile frond, natural size.
7. 8. Fronds, bearing receptacular gemmæ, natural size.
9. Stellated frond, natural size.

INTRODUCTION.

TO a work, professing to give a description of the various species of *Jungermannia* yet ascertained to be natives of the British isles, it appears desirable, if not indispensable, to prefix, by way of introduction, a short historical account of the genus itself, accompanied with some remarks upon its structure and peculiarities, and a few observations on those families which are most nearly connected with it.

SECTION I.

History of the Family.

The earlier botanists, who have taken notice of the plants belonging to this genus, have almost universally designated them by the appellations either of *Musci* or *Lichenes*. By the latter term, Fabius Columna has described the first *Jungermannia* that we find any where upon record; his "*Lichen alter minor caule calceato*," being very obviously, both from the description and figure, intended for our *J. epiphylla**; to which Dillenius and other subsequent writers have referred it.

It was not till the beginning of the last century, that the name of *Jungermannia* was first adopted; a name given by Ruppian†, to perpetuate the memory of Louis Jungermann, a German botanist, who was born in 1572, and died in 1653, after having published a catalogue of the plants of the neighborhood of Altorf, and a work entitled *Cornucopia Floræ Giessensis*. He likewise gave considerable assistance to Besler, in his *Hortus Eystettensis*. In the *Flora Jenensis*, however, we find no particulars relative to the characters of this new genus; nor do we, till Dillenius, imperfectly indeed, described the fruit of it in the *Eph. Nat. cur. Cent. v., vi.*, and in the Appendix, p. 52, and again in his *Flor. Giss.*, where he attributes to this tribe of plants, which he calls *Lichenastrum*, "*Capitula monococca (quibus et pediculis brevioribus a Lichene differt), aut nuda, aut folliculo inclusa, aut petalodes quid habentia, florem nempe monopetalum quadrifidum imitantia, quæ etiam loco apicum fecundationem conciliarent plantæ, licet semina desiderentur.*" p. 84. He farther speaks, in the Supplement of the same work, of a double covering to the young capsule, evidently alluding to the *calyx* and *corolla*, as they have since been termed.

* In his "*Minus cognitarum rariorumque nostro calo orientium Stirpium expressis*" &c. Romæ, anno 1616. 4to, p. 330.

† *Flora Jenensis*.

INTRODUCTION.

Vaillant has described these plants under the name of *Hepatica* and *Hepaticoides*, but has added little to what Dillenius had done, except noticing, in many instances, the *vaginæ*, and the quadrifid capsules.

Our countryman, Ray, is more particular in this respect. "*Lichenastrum* *," he says, "*est Musci genus fertile, vel, si placet, floribus insigne, cujus capitula longiusculis pediculis innascentia per maturitatem in quatuor plerumque æquales partes, cruciformem florem referentes, ad basin usque dividuntur, et farinam emittunt tenuissimam, apicum in floribus perfectioribus pollini respondentem, licet hic usus nec reliquis Muscis denegari queat, cum capitulorum pulvis similem prorsus figuram et structuram obtineat, si armato oculo examinetur. Ceterum simplicia et nuda sunt capitula, singula nempe singulis pediculis plus minusve longis insidentia, e vaginâ nunc simplici, nunc bivalvi, nunc in plures partes per summitatem divisâ egredientibus, quibus a Lichene clarissimè distinguitur hæc genus.*" This, however, includes our genus *Anthoceros*, which forms his first division: "*Lichenastrum capitulis bifariam se aperientibus.*" His second comprises our *Jungermanniæ*: "*Lichenastrum capitulis in quatuor segmenta florida, tanquam totidem petala se aperientibus:*" and this is subdivided into "*Foliis varie et minus determinate divisis,*" our *Jungermanniæ frondosæ*; and "*Foliis figuræ magis determinatæ,*" comprising the *Jungermanniæ foliaceæ*.

Micheli, with his accustomed talent for discrimination, has divided the genus *Jungermannia* into three; but has taken characters from the habit of the plant, rather than from the fructification, which unfortunately will not bear him out. His first genus, *Marsilea*, (our *Jungermanniæ frondosæ*) "*est plantæ genus flore monopetalo, campaniformi, patente, in quatuor profundas partes dissecto, ac veluti quatuor petalis constare videtur, sed sterili, filamentis aut potiùs, cum clarissimo Columna, staminibus tenuissimis, et pulverulentis, nunc in medio, nunc ad extremum donato. Idem calyce caret, et pediculo insidet, ac e vaginâ tubulatâ egreditur. Capsulæ autem seminales perexiguæ in plantis plerumque non floriferis, in nonnullis speciebus per totam foliorum superficiem, in aliis vero per eorum extremitatem occurrunt in quarum sinum unicum et rotundum habetur semen:*" and this, though it may at first sight appear the most natural of the three, yet is most variable in point of its fructification in the different species of which it is composed. With him, the second genus, *Jungermannia*, is "*a Marsileâ diversum, foliis in surculis bino ordine Trichomanis et Polygonati more quodamtenus dispositis. Semina in externâ plantarum parte extant;*" and his third, "*Muscoides,*" he says, "*est plantæ genus ab Jungermanniâ discrepans surculis tribus, quatuor vel quinque foliorum ordinibus vestitis: inferiores verò ordines superioribus sunt valde minores. Semina non in externâ foliorum parte sed recondito in sinu squamarum cujusdam fructûs, qui locustarum Graminis amoris formam præ se ferens, per surculos vel per plantas non floriferas innasci solet.*" Thus, in *Jungermannia*, this author has taken the *gemmae*, and in *Muscoides* and *Marsilea*, the anthers, for the seeds; and has made the character depend, in a great measure, upon their respective situations. The capsule he considers a monopetalous, campanulate, sterile or male flower.

* Raii Syn. Stirp. Brit. ed. 3. p. 109.

INTRODUCTION.

A slight alteration only is made by Haller, who, in his *Enumeratio Stirp. Helv.*, retains the genera established by Micheli, omitting, however, the seeds in their characters, and adding to *Marsilea* the peculiarity of the filaments being rolled in, and adhering, like a sponge, to the middle of the flower (capsule), which, indeed, is by no means the case with any of the family, except *J. epiphylla*.

Dillenius next comes again to be considered, in his *Historia Muscorum*, where he has given a more enlarged character to his *Lichenastrum*; and, after saying that the name is derived from the resemblance of its flowers to those of a Lichen, adds that it is, "Musci genus flore antheraceo nudo, ab initio globoso, dein in quatuor lacinias ad basim usque diviso, tetrapetaloides, florem Galii referente, farinam spargente teneram masculinam, et pediculo tenero pellucido, singulo singulo insidente, e theca seu calyce nunc simplici et integro, nunc quasi bivalvi, nunc in plures lacinias per summitatem diviso egrediente; quibus notis a Lichene clarissimè distinguitur hoc genus. Fæminina semina me adhuc latent in plerisque omnibus speciebus." He has, however, excluded *J. Trichomanis*, of which he does not appear to have known the fructification, and has made it a *Mnium*, from the powdery capitula which he saw at the termination of the branches.

Linnaeus, at length, in the last edition of the *Systema Naturæ*, firmly established the genus *Jungermannia*, and attributed to it the following character:

"MASC. pedunculatus, nudus. Anthera quadrivalvis.

FEM. sessilis nudus, seminibus subrotundis."

About twenty-five years subsequently, in 1760, the accurate Schmidel produced his *Dissertatio de Jungermannia character*, in which, after an elaborate history, he determined upon the following character. "*Jungermanniam*," he says, "vocamus ALGÆ genus, in cujus

MASCULINO Flore varii situs, vel in eâdem vel in distinctâ plantâ aut ramo,

Cal. nullus.

Cor. nulla.

Stam. Antheræ nudæ, vesiculares vel farinosæ, absque filis.

FEMININO Flore:

Cal. multiformis, monophyllus aut bilobus.

Cor. monopetala, limbo variè secto, frequentèr bilabiato.

Pist. Germen ovatum vel subrotundum, corollâ tectum; Stylus corollæ impositus, rectus; Stigma simplicissimum.

Per. Vasculum pedunculo recto, ultra calicem et corollam elevatum, subrotundum, vel oblongum, uniloculare, filamentis repletum, quadrivalve, valvis patentibus.

Sem. Plurima, minuta, subrotunda."

Haller, in his *Stirpes Helveticæ*, has altered the character which he had previously given in his *Enumeratio*, taking advantage of the labors of Micheli, Linnaeus, and Schmidel; making no mention, however, of either male or female fructification, but very properly including in the genus those *Jungermannia* which Linnaeus and Schmidel had made *Mnia*; and observing, "*Plurimæ Jungermannia*, forte et omnes, præterea passim

INTRODUCTION.

farinosos globulos gerunt, vel sessiles, vel pediculatos, quarum istos Linnæus Mniis accenset. Cùm tamen veram vaginam cavam, verumque florem quadrifidum, non capsulam calyptratam gerant, meliùs utique cum *Jungermanniâ* manent." (*Hall. Helv.* III. p. 57.) Yet, on the other hand, he takes in *Riccia fluitans*, whose fructification, however, it should be acknowledged, is to this day unknown.

Hedwig has studied, with his accustomed accuracy, this genus, confirmed many of the observations of Schmidel, and made known other new and important facts relating to the organs of fructification: among them is that alluding to the vegetation of the seeds of *Jungermanniæ*, which completely controverts the opinion of those botanists who have supposed the capsules to contain the farina peculiar to the male flowers.

The generic character, given in the Appendix to the *Species Muscorum* of this author, stands thus:

"JUNGERMANNIA. *Perigonium* monophyllum vel nullum. *Calyptra* fissa persistens.

Sporangium quadrivalve, *sporarum* fila linearia, torta.

Spermatocystidia ovata vel globosa, cingulo pellucido simplici vel articulado vel nullo munita, solitaria vel gregaria, sessilia vel pedunculata, superficiei trunci superiori vel inferiori adnata, vel substantiæ immersa, nuda vel folio perigonalii cincta.

Perigonia feminea variæ figuræ, compresso-truncata transversa et incurva, vel compresso-cristata margine dentato, vel campanulato-undulata. In speciebus perigonio destitutis, perigonii vices gerit calyptra fissa:" and he adds, that, by characters taken from the *perigonia* and the *spermatocystidia*, the *Jungermanniæ* may perhaps be divided into many genera.

The author that next merits our consideration is Schreber, who, having industriously selected the most striking characters from the writings of preceding botanists, has thus defined the genus:

MASCULI Flores sessiles in caule, foliis, frondibus glomerati.

Cal. vix ullus.

Cor. nulla.

Stam. Filamenta vix ulla. *Antheræ* ovatæ, uniloculares, apice dehiscentes.

FEMINEI Flores in eâdem vel distinctâ plantâ.

Cal. *Perianthium* erectum, tubulosum, truncatum, crenatum s-laciniatum.

Cor. *Calyptra* sessilis, perianthio minor, subglobosa, undique clausa, membranacea, tenera, stylo coronata, tandem apice rumpens.

Pist. *Germen* oblongum, calyptrâ obvolutum, sessile; *Stylus* brevis, rectus, per verticem calyptræ transiens; *Stigma* simplex.

Peric. *Capsula* setæ longæ tenerissimæ insidens, globosa, unilocularis, tandem longitudinaliter dehiscens in *Valvulas* quatuor, æquales, patentes, persistentes.

Sem. plurima, globosa, adhærentia filis tortis, elasticis, valvulis in fundo, apice, disco vel margine adfixis.

He likewise alludes to the *Jungermanniæ acaules*, which, he says, have their *anthers* buried in the substance of the frond, and want a perianthium to the female flowers; on which account he doubts if they ought not rather to be considered a distinct genus.

INTRODUCTION.

Roth has scarcely made a less excellent use of the labors of others, and has drawn up a concise account of the different parts of the fructification, summing up the whole in the following words :

“*Caps. subrotunda, setæ nudæ insidens, unilocularis, apice dehiscens : valvulis quatuor patentibus. Masculi floris perianthium nullum.*”

After the valuable discoveries of Schmidel and Hedwig, and the satisfactory reasons they had assigned for what they supposed to be the male and female fructification, it is rather surprising to find an able naturalist of our day, M. Palisot de Beauvois, controverting their system, and establishing a theory of his own ; according to which, he considers the anthers to be the female fructification, and the capsules the male ; and forms characters almost wholly from the former, which differ so little in all the species that I have had the opportunity of examining. Thus, having restored the Michelian genus, *Muscoides*, in his *Flore d'Oware et de Benin*, but changed its name to that of *Carpolopedium*, he gives the following character :

“**FLORES MASCULI** ; In ramulis distinctis ; pedunculati, globosi aut ovati, quadrifidi : Laciniae æquales, intus filamentosæ ; filamentis elasticis, articulatis, pulverulentis, aliorum vegetabilium stamina æmulantibus ; pedunculus albus, mollis, membranaceus, pellucidus ; vaginâ oblongâ, seu perichætio sessili, monophyllo, calyciformi infra cinctus.

“**FLORES FEMINEI** ; In ramis distinctis : Fructus ovatus, aut globosus, brevissimè pedunculatus, acumine parvo, styliformi acuminatus, solitarius, sub squamis bifariè imbricatis : Ramuli medio plerumque crassiores, suprâ infrâque attenuati, foliis distichis instructi.”

Hence it appears, as well from the above character of his genus, as from the species that the author enumerates as belonging to it, that he has attributed to the female (his male) fructification of *J. albicans*, *J. platyphylla*, *J. dilatata*, &c., distinguishing marks which they really have in common with all the rest of the species ; except, indeed, when he says that their elastic filaments are “*articulata*,” which does not hold good in any species. And in describing the male fructification (our female), his character would be such as to include, I think I may say, all the *Jungermannia foliosæ*, were it not that he states the “*fructus*” to be “*acumine parvo styliformi acuminatus*,” a peculiarity which I cannot find to exist in any species, and certainly not in any of those he points out as belonging to this genus ; not even his own *Carpolopedium dichotomum*, with specimens of which he himself obligingly favored me.

The genus *Marsilea*, likewise, he has adopted under the name *Rhizophyllum*, and proposes treating of it in a part of his *Aethéogamie*, which is, I believe, not yet published. A short notice of it, however, is given in the *Flore d'Oware et de Benin* already mentioned, where he thus speaks of it, and of his *Conianthos* (*Jungermannia*, Mich.). “*Nous ne pouvons non plus nous dissimuler que, dans le Rhizophyllum (Marsilea, Mich.) les fleurs femelles ou semences sont éparses sous l'épiderme, tantôt à l'extrémité des lobes des feuilles, tantôt dans toute leur longueur ; que, dans le Conianthos (Jungermannia, Mich.) ces mêmes fleurs ou semences sont nues et rassemblées en boule au sommet de quelques*

INTRODUCTION.

rameaux, ou des feuilles, dans quelques espèces; et que, dans le *Carpolopedium* (*Muscoides*, Mich.) ces mêmes graines ou fruits sont solitaires, cachés sous des écailles imbriquées et distinctes des feuilles."

In the first and last genera here mentioned, M. Palisot de Beauvois decidedly speaks of true anthers; but in his *Conianthos* he deduces characters of equal importance from the gemmæ, which he supposes to be capsules (our anthers), and wholly passes over the true anthers, which are precisely of the same nature as those of *Carpolopedium* and *Rhyzophyllum*, and are to be found with equal facility as they are in those species.

The character given by Mohr, in his *Fl. Crypt. Germ.*, is, perhaps, the best that has yet been assigned to the genus: "Plantæ Cryptogamæ. Ord. VI. Calyptrata. B. Deoperculata. Sporangium quadrivalve (ex anomaliâ interdum 8-valve.)"

Wahlenberg is almost equally happy in his definition. "Musci Hepatici. Capsula sine operculo, longitudinalitèr dehiscens, infernè tantum calyptrata.

FRUCTIFICATIONES dioicæ, rariùs monoicæ: steriles pulveracæ in apice ramulorum vel foliorum.

Fructus Calyx: *Perichætium* sacculiforme membranaceum vel carnosum.

Germen calytrâ tectum, stylicherum, in perichætio sessile.

Capsula in pedunculo subito elongando et caduco, univalvis, laciniis quatuor dehiscens. *Seminula* inter fila spiralia elastica."

And, lastly, Schwaegrichen gives the following character to his genus *Jungermannia*, in his *Prodromus Hist. Musc. Hepat.* "*Theca* quadrivalvis, nuda, *setæ* imposita. *Seminum elateres* lineares."

SECTION II.

On the different Parts of a Jungermannia.

I. ON THE ROOTS, STEM, LEAVES, AND STIPULES.

We shall begin with speaking of the

ROOTS,

Roots. Since they are the parts of a plant, by which it is principally nourished and supported. These are of two kinds: such as are composed of minute, simple, or rarely forked*, fibres; and such as seem to be a continuation of the stem itself, equalling it in thickness, and, like it, frequently branched.

* As in *J. trilobata* (tab. 76).

INTRODUCTION.

And first, of the more common *fibrous radicles*, of which it is rare that any individual of the genus is entirely deprived. It is true that, in plants which are upright in their growth and very densely crowded together, such as *J. Taylora* and *J. compressa*, they are discoverable only by means of a very careful examination. In some specimens of *J. pinguis* (tab. 46) alone, I have been unable to discover any vestige of roots; but these were floating on the water. For the most part they have their origin on the underside of the stem or frond, in those species which are destitute of leaves, and always, in these, originate upon the nerve, if the plant have a distinct nerve. If otherwise, as is the case in *J. epiphylla* and *J. pinguis*, they grow indifferently from various parts of the lower surface.

The highest powers of a microscope have enabled me to discover no peculiarity of structure in these fibres. They seem to be tubular throughout, never exhibiting any appearance of joints or constrictions, filiform, smooth, semitransparent, and of a very delicate membranaceous texture. In general they are colorless, or only tinged with light brown, which they might be supposed to derive from the soil on which they grow. *J. pusilla* (tab. 69) is remarkable for the deep purple hue of its roots; and those of *J. excisa*, *J. hyalina*, and *J. ventricosa*, not unfrequently partake the same tint.

Upon the *stipulaceous species* of *Jungermanniæ*, the roots generally grow in bundles, originating immediately beneath the stipules. In the *exstipulated*, they are thrown out indifferently, and in a more scattered manner from any, or every part of the stems and branches; even from those branches proper to the fructification, as in *J. trilobata* (tab. 76), *J. setacea* (tab. 8), &c. Even the calyx of *J. Trichomanis* (tab. 79), from its upper part, sends forth a few radicles; but the hairs which invest this calyx must not be mistaken for roots; since their direction is upwards, whereas that of the roots is always descending.

I have said that the origin of the roots, in most instances, is on the stem. As in the Mosses, so in the *Jungermanniæ*, an instance occurs of these roots proceeding from the leaves, as may be seen in *J. complanata* (tab. 81).

In *J. platyphylla* (Suppl. tab. 3) an example is found of the fibres being united in close fascicles, so as to appear like one thickened root. What I have described as such, I am now inclined to consider *flagella*, of a similar nature to those that are seen on *J. trilobata* (tab. 76); and, indeed, I have observed some appearance of foliaceous scales upon two or three individuals.

Mr. Lyell has directed my attention to a singular inflation at the lower extremity of many of the radicles in *J. anomala*, twice or thrice the diameter of the radicle itself, and which I am disposed to look upon as a disease in that part.

Roots of the larger kind, hinted at in the beginning of this section, occur rarely. We have instances in *J. Francisci* (tab. 49), *J. asplenoides* (tab. 13), *J. decipiens* (tab. 50), *J. Hookeri* (tab. 54), and in *J. emarginata* (tab. 27). In the second, third, and fourth of these species, these roots creep horizontally; in the rest they descend, and are sometimes branched, often themselves sending forth fibrous radicles. In all these there is no difference in structure from the stems; but their color is paler, generally whitish, and they are very succulent.

INTRODUCTION.

These seem to answer to the "*Radices primariae*," which Hedwig describes in the Mosses, and the "*primordiales*" of Bridel: whilst the fibrous ones are the "*Radices succedaneæ*" of the same author. The former are thus defined by him: "Quoad originem, radices sunt vel *primordiales*, quæ a seminis in plantulam explicatione præsentibus fuerunt, vel *succedaneæ*, quas caulis parte suâ inferiore diversis temporibus emisit. Radix autem *primordialis*, præsertim si unica et crassiuscula sit, non rarò in ipsum caulem ita continuatur, ut vix dignoscere queas ubi hic incipiat, illa desinat." (*Brid. Musc. Hist.* i. p. 6.)

All the species that I have yet observed to possess "*Radices primordiales*," are nearly erect in their mode of growth, and are found growing in earth, where these roots penetrate to various depths, or creep horizontally just beneath the surface. In those species which are prostrate in their places of growth, the fibrous roots alone are found; and, by means of these, they are more or less firmly attached to soil of various kinds, to rocks, trunks of trees, and decayed wood, or to Mosses, and even other *Jungermanniæ*. *J. platyphylla*, and, probably, all the individuals that are so densely imbricated, send forth roots, which strike into the leaves of their own stems over which they happen to lie, and from them appear to draw nourishment (See *Suppl.* tab. 3).

STEMS.

Stems. The stems of *Jungermanniæ* may likewise be separated into two kinds; such as are furnished with leaves (the *Jungermanniæ foliosæ* of Authors), and the *Jungermanniæ frondosæ*. *J. pusilla* (tab. 69) and *J. Blasii* (tab. 82, 83, 84) seem to be intermediate; but, in general, the character is very clearly impressed upon the plants, and they may be distinguished by their first aspect.

Form and Ramification. The first are by far the most numerous in point of species, and are, for the most part, cylindrical, or tapering gradually towards the extremity: in *J. incisa* (tab. 10) they are depressed: erect in their growth in *J. Hookeri* (tab. 54), *J. asplenioides* (tab. 13), &c.; and procumbent in *J. bicuspidata* (tab. 11), *J. byssacea* (tab. 12), and many others: simple in *J. lanceolata* (tab. 18), *J. excisa* (tab. 9), *J. exsecta* (tab. 19): slightly branched in *J. pumila* (tab. 17), *J. pusilla* (tab. 69): very much branched in *J. dilatata* (tab. 5), *J. Mackaii* (tab. 53), and *J. serpyllifolia* (tab. 42).

In general the branches are irregularly scattered; but in *J. reptans* (tab. 75), *J. Woodsii* (tab. 66), and *J. Tamarisci* (tab. 6), they are pinnate or bipinnate: sometimes the stems are dichotomous, as in *J. spinulosa* (tab. 14).

Innovations. Besides those branches, which, if I may so express myself, unfold themselves with the regular growth of the plant, *innovations* are very frequent upon the stems of *Jungermanniæ foliosæ*; and it is probable, that almost every species, at some or other period of its existence, produces them. Instances may be seen in *J. hyalina* (tab. 63), *J. compressa* (tab. 58), *J. crenulata* (tab. 37), &c. These must be carefully attended to; or, otherwise, from the shooting forth of an innovation immediately beneath a calyx, the fructification will appear lateral, which is, in reality, terminal.

Nerve. What I have said of the stems of the *Foliaceous Jungermanniæ*, applies equally to the species *frondosæ*, except that, in them, the stems, or nerves as they are called in these, are

INTRODUCTION.

rarely cylindrical. In *J. pubescens* (tab. 73) and *J. furcata* (tab. 55) they appear to be so; but, in *J. Blasia*, *J. pinguis*, and *J. multifida*, they are much depressed. They are prostrate or procumbent in *J. Lyellii* (tab. 77), *J. hibernica* (tab. 78), and most of this family: erect in *J. multifida* (tab. 45); in which species likewise occur examples of vague and regularly pinnatifid ramification. In *J. furcata* (tab. 55) the branches are dichotomous. In the same plant, too, and in *J. Lyellii* (tab. 77) and *J. epiphylla* (tab. 47), innovations are very common.

The principal difference between the *Jungermannia frondosæ* and the *Jungermannia foliosæ*, consists in the stems of the latter being provided with processes, which, from their similarity to the leaves in the phænogamous plants, are distinguished by the same name, whilst, in the former, the stems are either wholly naked, or are furnished with marginal expansions throughout their entire length, which, though of the same nature as the leaves, and though lobed, and even pinnatifid, as in *J. Blasia* (tab. 82), are never so deeply cut as to entitle them to that appellation. Among these may be reckoned *J. epiphylla*, *J. Lyellii*, *J. hibernica*, *J. furcata*, and *J. pubescens*; and, of the naked-stemmed species, *J. pinguis* and *J. multifida* are the only ones with which I am acquainted.

The structure of the stems is very simple, and altogether cellular. The *cellules* are small, separated by thin pellucid membranes; their *figure* oblong; and their substance filled with a colorless fluid, mixed with extremely minute granules, of a green olive or purple color, when the plant is in vigor, which consequently gives the same tinge to the whole of the stems. When these are of a dirty brown color, it arises, probably, from an injured and decayed state of the outer cellules; and the stem then becomes brittle: it is otherwise pliable, and, in the younger plants, even flaccid.

LEAVES.

The leaves of *Jungermannia* vary remarkably in their *insertion*, *direction*, and *figure*, and generally afford excellent specific marks of discrimination among the species.

No instance whatever is known of the leaves of these plants being situated on foot-stalks: they are always sessile, and not even contracted at the base; but, in many instances, as, for example, in *J. asplenoides* (tab. 13) and *J. spinulosa* (tab. 14), they are decurrent. In almost all the species with bifarious leaves, they have an oblique insertion; that is to say, one angle of the base is fixed in the back of the plant, whilst the opposite one is seen before it: thus the leaf is obliquely semiamplexicaul. In the species with multifarious leaves, such as *J. Hookeri*, *J. setiformis* (tab. 20), &c., the base half embraces the stem transversely. In *J. pusilla* (tab. 69) the leaves have their base running parallel with the stem.

In all the plants with bifarious leaves, either the *superior* or the *inferior surface* of the stem is more or less concealed by the imbrication of the leaves; and these two kinds of imbrication afford excellent characters for subdividing the genus. Thus, in *J. hyalina* (tab. 63) and *J. Sphagni* (tab. 33) the imbrication is inferior; whilst in *J. Mackaii* (tab. 53), *J. Hutchinsiae* (tab. 1), *J. Trichomanis* (tab. 79), and *J. dilatata* (tab. 5), it is superior

INTRODUCTION.

The bifarious insertion of the leaves is by far the most common, as in *J. curvifolia* (tab. 16), *J. scalaris* (tab. 61), &c. *J. julacea* (tab. 2), *J. laxifolia* (tab. 59), and *J. juniperina* (tab. 4), have them quadrifarious; and in *J. Hookeri*, (tab. 54) *J. trichophylla* (tab. 7) and *J. setacea* (tab. 8), they are multifarious; that is to say, they grow indiscriminately from all sides of the stem.

Direction.

The *direction* of the leaves is liable to considerable variation, even in the same species. In those with leaves disposed in multifarious directions, they generally point upwards, towards the extremity of the stem, whether that be erect, as in *J. Hookeri*, or prostrate, as in *J. setacea* (tab. 8). Such likewise is their direction in some species with bifarious leaves, of which we have examples in *J. emarginata* (tab. 27) and *J. concinnata* (tab. 3): but for the most part, the species of this section are endowed with leaves which are indifferently patent or erect; instances of which are seen in *J. anomala* (tab. 34), *J. Sphagni* (tab. 33), *J. Taylori* (tab. 57), &c. In *J. juniperina* (tab. 4) they are remarkable for pointing all one way.

In every British species of the genus, the leaves are alternate and distinct. In two foreign species, from New Zealand, I have seen them opposite, united, and perfoliate.

Form.

In describing the forms of the leaves, I must beg that the terms made use of may be understood with a certain degree of latitude; not only because some variation takes place in the leaves themselves, upon the same individual species, but because the terms in use for phænogamous plants are not strictly applicable to those of this family. When mention is made of an ovate or of an orbicular leaf, the expression is so far incorrect, that, having a broad transverse base, in general, the circumference will not form more than three-fourths of an ovate or orbicular figure. I allude to these forms more particularly, because they, and their various modifications, are the most frequent to which the leaves are subject.

They are ovate in *J. viticulosa* (tab. 60), *J. Trichomanis* (tab. 79), and in the upper leaves of *J. anomala* (tab. 34): obovate in *J. spinulosa* (tab. 14): orbicular in *J. Sphagni* (tab. 33): subquadrate in *J. polyanthos* (tab. 62) and *J. pusilla* (tab. 69): acinaciform in *J. albicans* (tab. 15): ligulate upon *J. Hookeri* (tab. 54): cuneiform upon *J. cuneifolia* (tab. 64): and ovate and orbicular leaves are frequently found on the same plant, as in *J. anomala* (tab. 34). In all, they are plane or convex.

In very many species they are more or less divided at or near the extremity. Slightly notched in *J. emarginata* (tab. 27) and in *J. concinnata* (tab. 3): deeply so in *J. excisa* (tab. 9), *J. ventricosa* (tab. 28), *J. bicuspidata* (tab. 11), *J. bidentata* (tab. 30): bifid in *J. julacea* (tab. 2): deeply so in *J. juniperina* (tab. 4): trifid in *J. trilobata* (tab. 76), *J. reptans* (tab. 75), *J. incisa* (tab. 10), and *J. capitata* (tab. 80): quadrifid in *J. setiformis* (tab. 20). In all these the segments are equal in size, and either expanded, as in most species; involute, as in *J. curvifolia* (tab. 16); or connivent, as in *J. connivens* (tab. 15).

A considerable variety is to be observed in the apices of the leaves, which are rounded and obtuse in a great number of species: acute in *J. Dicksoni* (tab. 48) and many others: acuminate in *J. juniperina* (tab. 4) and *J. curvifolia* (tab. 16): very sharp, and almost

INTRODUCTION.

cuspidate and diaphanous in some states of *J. barbata* (tab. 70): but none of the genus have ever, that I am aware of, a hair-like termination, which is so common among the leaves of the Mosses.

There are many species whose leaves are cleft into two segments of (generally) Division. unequal sizes; and these segments are conduplicate, or more or less folded and appressed to each other. I say generally, because, in *J. resupinata* (tab. 23), we have an example of nearly, and sometimes quite, equal conduplicate segments. In the rest they differ in size, and somewhat in figure. The division is slight in *J. exsecta* (tab. 19) and *J. minuta* (tab. 44): in some others, such as *J. complanata* (tab. 81), *J. Mackaii* (tab. 53), *J. hamatifolia* (tab. 51), and *J. minutissima* (tab. 52), the leaf might rather be described as having a small lateral appendage, which is usually involute, than as being divided into two segments; but a regular gradation from *J. minutissima*, through *J. serpyllifolia*, *J. Mackaii*, and *J. complanata*, to those which are strikingly two-lobed, is so imperceptible, that it is not possible to draw a line of distinction.

In other species the lobes are deeply divided, particularly in *J. umbrosa* (tab. 24), *J. platyphylla* (tab. 40), *J. undulata* (tab. 22), *J. nemorosa* (tab. 21), and *J. planifolia* (tab. 67). In this last species, many of the leaves are divided down to the very stem; in so much that I have been led to describe the two lobes as distinct leaves, which, in fact, they are, in some parts of the plant, whilst, in others, subsequent examinations have enabled me to discover these lobes united, and resembling so nearly those of *J. nemorosa* (tab. 21), that I should be tempted to regard it as a variety of that plant, did not my friend, Dr. Taylor, who has gathered it on its native mountains, hold quite a different opinion.

In every instance, the larger segment or lobe is plane, or more or less concave; remarkably so in *J. minutissima* (tab. 52): in *J. calyptrifolia* (tab. 43), calyptriform. The smaller one is more variable, being plane in *J. platyphylla* (tab. 40), *J. nemorosa*, &c.: involute in *J. Mackaii*, *J. complanata*, *J. serpyllifolia*, and *J. calyptrifolia*: saccate in *J. cochleariformis* (tab. 68), *J. Hutchinsiae* (tab. 1), *J. dilatata* (tab. 5), and *J. Tamarisci* (tab. 6).

The larger lobe is sometimes again divided, as in *J. Woodsii* (tab. 66) and *J. ciliaris* (tab. 65): in *J. cochleariformis* it is notched at the apex. The smaller one is, I believe, in every instance entire.

In all the kind of leaves the margins are for the most part entire: serrated in Margina. *J. albicans* (tab. 15) and *J. umbrosa* (tab. 24): dentate in *J. asplenioides* (tab. 13): spinoso-dentate in *J. spinulosa* (tab. 14), *J. Hutchinsiae*, and *J. Woodsii*: beautifully ciliated in *J. ciliaris* (tab. 65): and finely lacinate in *J. tomentella* (tab. 36).

If the structure of the stems be simple, so likewise is that of the leaves; for it is the Structure. same in both: a tissue of cellules, of a roundish or ovate figure, sometimes, from the closeness with which they are placed, appearing hexagonal. I cannot satisfy myself that there really exist any pores in these cellules, though I have thought I saw traces of them in those of *J. juniperina*. They are filled with a pellucid liquor, and colored granules, green in the greater number of species; brown in *J. juniperina*; and purple in some of the varieties of *J. nemorosa*, *J. cochleariformis*, and *J. compressa*.

INTRODUCTION.

Cellules.

Sometimes the relative size of the cellules will afford, in the absence of the fructification, tolerably good specific marks of discrimination. Thus, in *J. Taylora* they are very large; in *J. scalaris* much smaller; and in *J. Sphagni* minute; yet the form of the leaves, in all three, is nearly the same. When the leaves of the *Jungermannia* have been dried, and are recovered by immersion in water, the cellules are dark in the centre, and have a pellucid border around them; a circumstance which arises from the collapse of the juices, and accumulation of the granules, in the middle of the cell. Just the same takes place in the *Conferva*, between the structure of which, and that of the *Jungermannia*, there seems to be a close analogy.

Surface.

The leaves of all the species are destitute of every kind of hairiness or scabrosity. In one of the frondose species, *J. pubescens* (tab. 73), the surface of the plant, both above and below, is covered with white, pellucid hairs.

In a variety of *J. hamatifolia*, I have seen the cellules very prominent and pointed, so as to give the appearance of a curiously tuberculated leaf (See *Suppl.* tab. 3). In all the other species the surface is smooth; and even shining in *J. Sphagni*, *J. hyalina*, and *J. lævigata*.

Nerve.

Nor is there any thing which precisely accords with the nerve of Mosses in the leaves of these plants. The appearance of a nerve in *J. albicans* (tab. 15), is only caused by the different form of the cellules, narrower and longer than the rest: but they are not prominent on either surface, like the nerves of Mosses. *J. prostrata*, of Swartz's *Fl. Ind. Occ.*, has a nerve resembling that of *J. albicans*.

Perigonial leaves.

The *perigonial leaves*, or those which contain the *anthers*, in general differ but little from the rest, except in being more closely imbricated, and in having a swelling at the base where the anthers are lodged, as in *J. asplenioides* (tab. 13). Frequently these are wanting. In some of the frondose species, as *J. Lyellii* (tab. 77) and *J. hibernica* (tab. 78), the perigonium is a scale resembling a stipule in the foliaceous species; and, in *J. furcata* (tab. 55) and *J. pubescens* (tab. 73), the anthers are inclosed within an innovation of the frond, which is rolled up into a ball.

Perichæatial leaves.

The *perichæatial leaves*, or those which surround the calyx, differ in general much more from the cauline ones. Even in the bifarious species they frequently grow from all sides of the stem, as in *J. capitata* (tab. 80) and *J. emarginata* (tab. 27). They are wholly wanting in *J. Trichomanis* (tab. 79): and, in *J. obtusifolia* (tab. 26), *J. nemorosa* (tab. 21), &c., they scarcely differ from the rest. In *J. Hookeri* (tab. 54) and *J. concinnata* (tab. 3) they are very concave, and entirely embrace the young fructification, seeming to answer the purpose of a calyx. In *J. juniperina* (tab. 4), *J. emarginata* (tab. 27), and *J. scalaris*, (tab. 6), they are united at their lateral margins, and appear almost converted into a calyx. In many species they are more cleft than the cauline leaves; as for example, in *J. Turneri* (tab. 29) and *J. excisa* (tab. 9). In *J. connivens* (tab. 15) and *J. setacea* (tab. 8) they are palmate. In *J. polyanthos* (tab. 62), *J. Sphagni* (*Suppl.* tab. 33), *J. reptans* (tab. 75), and *J. trilobata* (tab. 76), they resemble small scales: and in *J. dilatata*, *J. Tamarisci*, *J. Mackaii*, *J. serpyllifolia*, *J. hamatifolia*, and *J. minutissima* (tab. 5, 6, 53, 42, 51, 52), the lobes of these are large and expanded, which, in the rest of the leaves, are small and involute, or saccate.

INTRODUCTION.

STIPULES.

Besides the leaves just described, the stems of many species of *Jungermanniæ* are Stipules, furnished with small scales or foliaceous processes, which, by most authors, are denominated stipules. These, in every instance, are produced on the lower side of the plant, whether the leaves are imbricated on the superior or inferior surface. Where they exist at all they are generally found throughout the whole length of the plant, placed at equal distances, one between each pair of leaves: yet in *J. compressa* and *J. Sphagni* they appear only on the younger shoots; and in *J. scalaris*, *J. Taylora*, and *J. anomala*, they are with difficulty to be discovered. They are widely subulate in the three last-mentioned species: ovate and entire in *J. albescens* (tab. 72): of the same shape, and toothed or lacinate in *J. Blasia*, *J. stipulacea* (tab. 41), and *J. viticulosa*: ligulate in *J. lævigata* and *J. platyphylla*: bifid and entire in *J. Francisci* (tab. 49), *J. cuneifolia*, *J. polyanthos*, *J. minutissima*, *J. hamatifolia*, &c.: bifid and lacinate in *J. Woodsii*, *J. barbata*, *J. heterophylla* (tab. 31), and *J. bidentata*: four or five toothed or lobed, with the lobes entire in *J. reptans* (tab. 75) and *J. trilobata* (tab. 76): lobed and ciliated in *J. ciliaris*: quadrate and finely lacinate in *J. tomentella* (tab. 36). Their margins are mostly plane, but recurved in *J. platyphylla* and *J. Tamarisci*.

II. ON THE ORGANS OF REPRODUCTION.

A. On the Parts of the Fructification.

ANTHERS.

Under the denomination of the *anthers* of *Jungermanniæ* Hedwig has described two *Anthers*. kinds of organs, whose structure is extremely different. The one I shall have occasion presently to speak of; that which consists simply of pellucid granules, without any visible internal organization, and which I have, I fear, incorrectly, in the course of my descriptions, described by the name of *gemmae*: the other is what I look upon to be the true anthers, at least as much so as the anthers of Mosses, with the structure of which there seems to be the greatest affinity, and especially with those of the genus *Sphagnum*. Like them they are nearly spherical in all the species, except in *J. Blasia* (tab. 82), where they are ovate or elliptical, externally composed of an extremely thin, pellucid, diaphanous, reticulated membrane; which reticulation is caused, in all probability, by cellules, of which it is the boundary. Within it is filled with a fluid and mixed with a very minute granulated substance, generally of an olivaceous or greyish color, but yellow in *J. pusilla* (tab. 69), and orange in *J. Hookeri* (tab. 54): this, when the anther has arrived at a state of maturity, escapes through an irregularly shaped opening, which bursts at the extremity; and then the cuticle turns brown and decays.

The *anther* terminates, in the greater number of species, a short filament, or white, pellucid, delicate, cellulose footstalk. In *J. pinguis* this footstalk is scarcely discernible, and

INTRODUCTION.

in *J. epiphylla* and *J. Blasia* I cannot find that it exists at all: the anthers appear not only sessile, but imbedded, in the latter species, in the substance of the nerve; and, in the former, in a lateral process or peculiar receptacle, evincing an approximation to the genus *Marchantia*. The footstalk is found in all the foliaceous species of *Jungermannia*.

In the frondose species, the *anther* is, as just observed, sometimes buried in the nerve; sometimes it is affixed to the upper surface, as in *J. Lyellii* (tab. 77) and *J. hibernica* (tab. 78), and sometimes to the lower surface, as in *J. furcata* and *J. pubescens*: in either case it is covered by a proper perigonial scale.

In most instances the anthers are, in the foliaceous species, concealed by closely-imbricated perigonial leaves; each leaf inclosing an indefinite number, from one to five or six: sometimes they are to be seen on the old branches; sometimes, as in *J. platyphylla* (tab. 40) and many others only upon the innovations, which, after the decay of the anthers, become perfect branches. They are on some individuals, as *J. Hookeri* (tab. 54), in the axillæ of leaves that are not closely imbricated, and they are then exposed to view; but not so much so as in *J. lanceolata* (tab. 18) and *J. pusilla* (tab. 69), where they are placed on the stem, without any covering or protection whatever. Frequently they are found on the same plants which bear the female fructification; but more usually on distinct individuals.

CALYX.

Calyx.

As in the phænogamous plants, so in this genus, species are to be met with that are quite destitute of a *perichætium* or *calyx*, as I have hitherto called it; of such, examples are seen in *J. concinnata* (tab. 3) and *J. Hookeri* (tab. 54). In *J. compressa* (tab. 58), *J. juniperina* (tab. 4), and *J. scalaris* (tab. 61), the perichætial leaves, by their union, seem to perform the office of the calyx in affording protection to the germen within. This part, in the greater number of species, is single; very small and by no means concealing the calyptra in *J. furcata* (tab. 57) (where it is like a scale), in *J. epiphylla* (tab. 47), *J. multifida* (tab. 45), and *J. pinguis* (tab. 46), where it is cup-shaped. In *J. polyanthos* (tab. 62) it is half the length of the calyptra; whilst, in almost every other of the genus, it is much shorter. Its most common figure is tubular, with the mouth, however, smaller than the diameter at the middle, as in *J. excisa*, *J. setiformis*, &c. In *J. lanceolata* (tab. 18) the apex is depressed: acuminate in *J. pumila*: in most a little plicate. In *J. asplenioides* (tab. 13), *J. nemorosa*, *J. complanata*, and several others, it is compressed, and, before the exertion of the capsule, is curved at the apex and always a little slit down on one side: angular in *J. crenulata* (tab. 37), *J. hyalina* (tab. 63), *J. Mackaii* (tab. 53), *J. minutissima*, and in *J. hamatifolia*; in which latter the angles are often serrato-dentate: campanulate in *J. pusilla* (tab. 69).

Mouth.

The mouth is generally roundish, toothed in many species, four cleft in *J. sphærocarpa*; beautifully ciliate in *J. connivens* and *J. trichophylla*; truncate and flattened in *J. undulata* and *J. asplenioides*.

Substance.

The substance is, in almost all the species, very nearly the same with that of the leaves; membranaceous in *J. Blasia*, approaching to carnose in *J. tomentella*, exceedingly so in *J. Trichomanis* and *J. viticulosa*: it is smooth on the surface in every species, except *J. dilatata*, in which it is tuberculated.

INTRODUCTION.

In regard to *situation*, the calyx is either terminal, as in *J. asplenoides*, *J. exisa*, &c.: *Situation.* lateral as in *J. hamatifolia*, *J. calyptrifolia*, *J. viticulosa*, and *J. Trichomanis*: placed upon short lateral branches, as in *J. Tamarisci*, *J. albescens* (*Suppl.* tab. 3), and *J. Sphagni* (*Suppl.* tab. 4); or upon short branches at the base of the shoots, as in *J. bicuspidata* (tab. 11) and *J. connivens*. Lateral, upon the superior surface of the stem in *J. pusilla*: arising from the lower side of the stem in *J. Sphagni* and *J. trilobata*.

The insertion of the calyx is in every instance, among the British species at least, *Insertion.* upon its base, so that it becomes erect, except in *J. Trichomanis* (tab. 79) and *J. viticulosa* (tab. 60), where the calyx is affixed to the stem by the side of the mouth; and the calyx itself is thus pendent and buried in the earth. I have seen a similar instance in a species brought by Mr. Menzies from New Zealand, where, however, it is terminal upon an upright growing plant, and, consequently, never buried in the soil, like our species.

Among the frondose *Jungermannia*, we find two species which possess the peculiarity *Double Calyx.* of having a double calyx, *J. Lyellii* (tab. 77) and *J. hibernica* (tab. 78); of these, the outer is small and lacinated; the inner much larger, and ovate or oblong: in one, it exceeds the length of the calyptra; in the other it is shorter. A still more remarkable circumstance takes place in *J. Blasia*, where the calyx is imbedded within the substance of the frond (tab. 83). In *J. epiphylla* it originates on the upper surface; in *J. pinguis* and *J. multifida* (tab. 45) at the side; and in *J. furcata* from the underside of the nerve.

PISTILLA.

Of these there are from three to eight or ten which are immediately surrounded by *Pistilla.* the calyx, or, in the absence of that, by the perichætal leaves. Their form is linear, and approaching to lanceolate in some species; but short and ovate in *J. pinguis*, *J. furcata*, and *J. multifida*: their mouth is always slightly expanded. Their structure likewise appears to be cellular: their color is whitish or pale grey with a few reddish longitudinal striæ. One, or rarely two, of these *pistilla* is made fertile; and then the lower part swells, and becomes the *germen*, of an olive green color, whilst the upper remains as the style, varying in length in different species. Of this *germen*, the exterior part (which seems to have some affinity with the arillus of the *Carices*) constitutes what is called the

CALYPTRA:

this consequently takes the form of the full-grown *germen*: it is membranaceous in *Calyptra.* the greater number of species; subcarnose in *J. epiphylla*, *J. pinguis*, *J. multifida*, and *J. furcata*; but, smooth in all, except the two last, of which, in *J. multifida*, it is tuberculated, and in *J. furcata* hispid. When the *germen* is sufficiently large: the interior part, now become the *capsule*, bursts with an irregular vertical opening at or near the summit, and the capsule elevated upon its white, cellulose

PEDUNCLE,

is protruded to various lengths, according to the species; being very long in *J. epiphylla* *Peduncle.* and *J. pinguis*; short in *J. furcata*, *J. platyphylla*, *J. juniperina*, &c. In *J. heterophylla* it

INTRODUCTION.

not unfrequently happens that an unevenly torn portion of the calyptra is carried up with the capsule, as is the case in the genus *Sphagnum* among the Mosses.

CAPSULE.

Capsule.

If a young capsule, before it has burst the calyptra, be examined, it will be found to be of an ovate figure, exhibiting no appearance of sutures. Within is seen a pulpy substance, consisting of a cellular tissue, filled with a pellucid liquor, and numerous granules, of a dark or olive-green color, varying in size; and the whole traversed by twisted brown lines, formed by the spiral filaments.

When the capsule is protruded beyond the calyptra, the external part of it becomes hardened and the color generally deeper, brown, and glossy; the sutures of the valves, too, are visible. The cellular substance, and the liquor within, are then absorbed, and nothing is seen but the granules become seeds, and the spiral filaments traversing them.

Texture.

The texture of the capsule is corneous, in the greater number of species; almost membranaceous and pale brown in *J. platyphylla*, *J. Mackaii*, *J. pusilla*, and *J. epiphylla*; quite membranaceous, white, and transparent in *J. serpyllifolia*, *J. hamatifolia*, *J. calyptrifolia*, and *J. minutissima*. In the four last-mentioned species, the capsule opens into four valves or segments, which do not reach more than half way down the capsule; in *J. pusilla* it bursts irregularly into valves of various sizes; but in all the rest into four equal valves, extending to the very base. Sometimes as in *J. Lyellii*, *J. Hookeri*, *J. juniperina*, and, probably, some others, five valves are seen; and sometimes only three: but this may arise from accidental causes. In all those which are divided down to the base, the valves become quite expanded: in those species whose filaments are attached to the apices of the valves, they are sometimes prevented from doing so by the entanglement of these filaments.

Structure

The structure of the ripe valves of the capsule has something remarkable about it; yet nothing, I think, but what might arise from a cellular formation, and the cellules becoming hardened. They appear to be striated longitudinally, with striæ placed at tolerably regular distances, and connected by more or less closely placed, transverse ones. These lines may be the divisions of the cellules. Externally they form grooves or furrows on the surface of the capsule. Such, at least, is the case in the greater number of species. In *J. minutissima*, and the curious little family to which it belongs, the capsule is irregularly reticulated, like the anthers.

Spiral
Filaments.

The spiral filaments that are found in the capsules of this genus, and some of the neighboring ones, are deserving of minute attention. How they are attached in many instances, I am wholly at a loss to discover; for, in general, after the bursting of the capsule they lie quite loose among the seeds. In *J. furcata*, *J. epiphylla*, and *J. Hookeri*, they are formed of a simple helix, and remain, after the discharge of the seeds, attached to the extremity of the valves of the capsule. In *J. serpyllifolia*, and its congeners, the point of attachment is the same; but the helix is double and enveloped by a thin, pellucid, tubular membrane. A similar membrane envelops the long filaments of *J. epiphylla*, which are attached, after the dispersion of the seeds, to the central base of the capsule, where they form a beautiful tuft or pencil. It is possible that this membrane may exist in all the

INTRODUCTION.

species, in a young state of the capsule, at which period I have sometimes seen it in those in which I have looked for it in vain when the capsule has been ripe.

The substance of the spiral filaments is, as far as their extreme minuteness will allow Substance. me to judge, nearly the same as that of the capsule itself; their color brownish or fulvous and opaque; they are narrowed at each end, and compressed: they are short in *J. pusilla*; very long in *J. epiphylla*. In all cases they have a strong elastic force; becoming more closely twisted and contracting with heat and dryness, and expanding with moisture. On the bursting of a capsule, they are instantly, from their exposure to the dry air, put in action, and, by their elastic impulse, discharge the seeds with a sudden motion to a considerable distance; whence they have merited the name given them by the Germans of *seed-dispersers*.

SEEDS.

The seeds themselves are, for the most part, spherical, numerous, minute, brown, Seeds. and opaque; smooth in the greater number of species; rough in *J. pusilla*: large, and comparatively few in number, in the capsules of *J. minutissima*, and of an oblong shape, and a green color. Hedwig has seen the seeds of *J. epiphylla* vegetate; and his account will be found under my description of that species.

B. Of the Gemmæ.

Besides the means of increase by seed, some of the *Jungermannia*, like most other *Gemmæ*. cryptogamous plants, possess the property of propagating their kind by gemmæ; in the same way as many species of *Allium*, *Polygonum viviparum*, &c., among the phænogamous plants. Of these I have treated as much as was in my power under the description of those species which I have found to be furnished with them, so that I have but few words to say upon the subject here.

Hitherto I have found *true gemmæ* only upon a few species. In *J. minutissima*, *J. serpyllifolia*, *J. hamatifolia*, and *J. calyptrifolia*, they appear to be produced upon the stems. In *J. complanata* upon the margins of the leaves. In *J. furcata* upon the extremity of the frond; and in *J. Blasia* within proper tubular receptacles. In all they precisely resemble in structure the leaves or the frond of the individuals which produce them. In the four first, as well as in the last-mentioned species, they are spherical. In *J. complanata* and *J. furcata* more or less oblong. Those of *J. furcata* may without much difficulty be observed in their progress towards perfect fronds: and those of *J. Blasia*, even before their escape from the receptacles, are endowed with roots, and their developement into perfect plants has been detected by the acuteness of Schmidel and Hedwig.

I lament that I have called by the same name bodies of a much more simple and less organized structure, which are found on the leaves of *J. incisa*, *J. ventricosa*, *J. orcadensis*, *J. nemorosa*, &c., and on the ends of the branches in *J. Sphagni*, (*Suppl. tab. 2*), *J. Trichomanis*, and *J. bicuspidata*, &c., in all of which they are collected into more or less compact spherical heads. Each is an ovate or angular, pellucid, greenish granule or vesicle.

INTRODUCTION.

Frequently, on their falling away from the leaves, as in *J. excisa* (Suppl. tab. 2) and some others, the leaves appear injured and jagged, as if the cellules had been torn off; and it is not improbable but that, in certain states of the plant, this may really be the case; so that each of these particles may be looked upon as a cellule. Their color, when first formed, too, is generally green, turning to brown in an older state, as in *J. nemorosa*, and to a fine red in *J. exsecta*.

SECTION III.

On Jungermannia as a Genus, and on the Arrangement of the British Species.

As far as my experience enables me to offer an opinion, from my acquaintance with the British and many foreign species, the plants that at present form the genus *JUNGERMANNIA*, however numerous, cannot be divided into other genera by means of characters taken merely from the fructification. In this respect, those which seem most allied in habit, often differ essentially; so that, with regard to the *Jungermanniæ frondosæ*, for example, which at first sight appear to demand a separation, unless there are made almost as many genera as species, I do not know any character which they have in common, by which they might be discriminated from the *Jungermanniæ foliosæ*.

Jungermannia nemorosa, *resupinata*, *umbrosa*, and *undulata*, have a peculiar habit about them, and have, moreover, a remarkably compressed calyx, truncate at the mouth; and we may think here to have discovered a character by means of which they may be removed from the rest of the genus: but an examination of other species will convince us of the inadequacy of this character; since *J. asplenoides* and *J. complanata*, two plants very different in other respects, have a calyx of the same shape.

A still stronger peculiarity of habit seems to unite *J. serpyllifolia*, *J. hamatifolia*, *J. calyptrifolia*, and *J. minutissima*, in which also the singular structure of the capsule, and especially its short valves, seems to claim for them the privilege of being considered a distinct genus; yet there are two species, *J. Mackaii* and *J. platyphylla*, which connect them by an easy gradation with *J. dilatata* and *J. Tamarisci*.

The following character of the genus I would propose as liable to fewer objections than any that has yet been given.

CLASS AND ORDER.

CRYPTOGAMIA, HEPATICÆ. Schreb.

(NATURAL ORDER.

HEPATICÆ. Juss. De Cand. PLANTÆ CRYPTOGAMÆ, CALYPTRATÆ, DEOPERCULATÆ. Mohr.)

GENERIC CHARACTER.

Receptaculum fructûs commune nullum.

Cal. Perichætium monophyllum tubulosum, rariûs nullum.

INTRODUCTION.

Calyptra germen tegens, apice ad capsulam emittendam verticalitèr rumpens, stylogera.

Capsula pedunculata, ovata vel sphærica, in valvas quatuor, plùs minùsve longas, longitudinalitèr fissa; rarissimè enormitèr disrupta.

Columella nulla.

Semina filis spiralibus elasticis immixta.

CHAR. ESSENTIALIS. *Receptaculum* fructûs commune nullum. *Perianthium* monophyllum, tubulosum. *Capsula* pedunculo calyce longiori insidens, quadrivalvis.

This distinguishes it at once from *Marchantia*, by the absence of the common receptacle for the fructification: from *Anthoceros*, by the four-valved capsule, and the want of a columella: from *Targionia*, by the monophyllous calyx: and from *Riccia* and *Sphærocarpus*, by the long footstalks of the capsules. Indeed, were it not for the anomalous capsule of *J. pusilla*, the Linnæan character, "*capsula quadrivalvis*," would, I think, be admirably characteristic of the whole genus.

I shall now offer an Analytical Table of the species described in the present work, arranged, in some degree, according to a method employed by Lamarck and De Candolle in their *Flore Française*, with alterations principally suggested by my valued friend, Mr. Lyell; and I shall then proceed to give full and amended characters of them, with additional notes and synonyms, which will conclude this Introduction, already, perhaps, carried to too great a length.

1000

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1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

JUNGERMANNIARUM BRITANNICARUM

CLAVIS ANALYTICA.

JUNGERMANNIÆ,

- A. { FRONDOSÆ 1.
 { FOLIOSÆ B.

(FRONDOSÆ.)

1. Nervo præditæ 2.
 Nervo obsoleto 7.

(Nervo præditæ.)

2. Frondibus pubescentibus *J. pubescens.*
 Frondibus lævibus 3.
 3. Calyptrâ inferiore*, hispidâ *J. furcata.*
 Calyptrâ superiore, lævi 4.
 4. Calyce duplice 5.
 Calyce simplice 6.
 5. Calyptrâ calycem interiorem excedente *J. Lyellii.*
 Calyptrâ calyce interiore multo brevior *J. hibernica.*
 6. Frondis margine subintegro *J. epiphylla.*
 Frondis margine insignitè lobato *J. Blasia.*

(Nervo obsoleto.)

7. Fronde valdè ramosâ, compressâ, calyptrâ tuberculatâ *J. multifida.*
 Fronde simpliciusculâ, subtùs tumidâ, calyptrâ glabrâ *J. pinguis.*

* By *calyptra inferior*, I mean that it originates on the underside of the stem, as *calyptra superior* does on the upper.

CLAVIS ANALYTICA.

(FOLIOSÆ.)

B. { Exstipulatæ C.
 { Stipulatæ H.

C. { Foliis multifariam insertis 1.
 { Foliis bifariis * D.

1. Foliis quadrifariis 2.
 1. Foliis absque ordine undique dispositis 4.

(Foliis quadrifariis.)

2. Calyce foliis perichætalibus immerso *J. juniperina.*
 2. Calyce exserto 3.
 3. Calyce ovato, ore contracto (*foliis teneris*) *J. laxifolia.*
 3. Calyce oblongo, ore aperto (*foliis rigidis*) *J. julacea.*

(Foliis absque ordine dispositis.)

4. Foliis subovatis, calyce nullo *J. Hookeri.*
 4. Foliis setaceis 5.
 5. Foliis fasciculatis, calyce dentato *J. trichophylla.*
 5. Foliis bi-tri-nis, calyce ciliato *J. setacea.*

(Foliis bifariis.)

D. { Foliis indivisis 1.
 { Foliis divisis E.

(Foliis indivisis.)

1. Foliis serrato-dentatis 2.
 1. Foliis integerrimis 4.
 2. Foliis rotundatis *J. asplenoides.*
 2. Foliis plùs minùsve ovatis 3.
 3. Foliis obovatis, omnibus spinuloso-dentatis *J. spinulosa.*
 3. Foliis ovatis, hìc illìc integerrimis *J. decipiens.*
 4. Foliis rotundatis 5.
 4. Foliis plùs minùsve ovatis 11.

* By this I mean, that the leaves are inserted on two opposite sides of the stem, whatever their direction may be.

CLAVIS ANALYTICA.

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5. Calyce laterali (*inferiore*) *J. Sphagni* *.
6. Calyce terminali 6.
6. Calyce compresso, angulato 7.
7. Calyce terete 9.
7. Calyce foliis perichæatialibus immerso *J. compressa* *.
8. Calyce exserto 8.
8. Calyce supernè quadrangulato, foliis undulatis, immarginatis *J. hyalina*.
8. Calyce per totam longitudinem quadrangulato, foliis concaviusculis, mar- }
ginatis } *J. crenulata*.
9. Calyce apice depresso *J. lanceolata*.
10. Calyce plùs minùsve acuminato 10.
10. Calycis ore dentato *J. pumila*.
10. Calycis ore quadrifido *J. sphaerocarpa*.
11. Foliis amplexicaulibus *J. cordifolia*.
11. Foliis falcatis, liberis *J. Donniana*.

(*Exstip fol. bif. divis.*)

- E. { Foliorum segmentis pluribus quàm duobus 1.
Foliorum segmentis duobus 4.

(*Foliorum segmentis pluribus quàm duobus.*)

1. Foliis quadripartitis *J. setiformis*.
1. Foliis trifidis 2.
2. Calyce campanulato *J. pusilla* †.
2. Calyce oblongo-ovato 3.
3. Foliorum segmentis (nunc 2.) integris *J. capitata* †.
3. Foliorum segmentis denticulatis *J. incisa*.

(*Foliorum segmentis duobus.*)

4. Foliorum segmentis æqualibus (*explanatis*) 5.
4. Foliorum segmentis inæqualibus (*conduplicatis*) F.

(*Foliorum segm. 2. æqualibus, explanatis.*)

5. Foliorum marginibus revolutis *J. Orcadensis*.
5. Foliorum marginibus non revolutis 6.

* *J. Sphagni* and *J. compressa*, if the young shoots alone are examined, will be seen to possess small stipules ; but, as I never could find them on the older stems, I have thought it best to place them in the division *Exstipulatæ*.

† This species has the leaves very indistinctly divided ; yet, I think, it cannot enter into any other family than the present.

‡ *J. capitata* has the leaves sometimes, though rarely, bifid, and it might be looked for in the following tribe.

CLAVIS ANALYTICA.

6. Caule erecto 7.
 6. Caule procumbente 8.
 7. Calyce foliis perichæatialibus immerso (*fol. subpatentibus*) *J. emarginata.*
 7. Calyce nullo (*fol. arcè imbricatis*) *J. concinnata.*
 8. Caule simplice vel simplicitèr ramoso 9.
 8. Caule vel surculo substellatim ramoso 11.
 9. Foliorum segmentis obtusis, calyce pyriformi *J. inflata.*
 9. Foliorum segmentis acutis, calyce ovato vel oblongo 10.
 10. Foliis emarginatis, sinu obtuso *J. ventricosa.*
 10. Foliis emarginatis, sinu obtusiusculo *J. excisa.*
 11. Foliis serratis *J. Turneri.*
 11. Foliis integerrimis 12.
 12. Foliorum segmentis rectis 13.
 12. Foliorum segmentis curvatis 14.
 13. Calyce terminali *J. byssacea.*
 13. Calyce subradicali *J. bicuspidata.*
 14. Foliorum segmentis brevibus, conniventibus *J. connivens.*
 14. Foliorum segmentis longis, incurvatis *J. curvifolia.*

(Foliorum segm. 2. inæqual. condupl.)

- F. { Segmentis inferioribus minoribus 1.
 { Segmentis superioribus minoribus G.

1. Segmentis inferioribus inflatis *J. cochleariformis.*
 1. Segmentis inferioribus planis appressis *J. complanata.*

(Segmentis inferioribus majoribus.)

- G. { Calyce compresso 1.
 { Calyce terete 5.

1. Foliis dentatis 2.
 1. Foliis integerrimis 4.
 2. Foliorum lobis ad basin usque partitis *J. planifolia.*
 2. Foliorum lobis evidentissimè unitis 3.
 3. Foliorum lobis obovatis, ciliato-dentatis *J. nemorosa.*
 3. Foliorum lobis ovatis, acutis, serratis *J. umbrosa.*
 4. Caule erecto, foliorum lobis inferioribus multò minoribus *J. undulata.*
 4. Caule procumbente, foliorum lobis subæqualibus *J. resupinata.*

(Calyce terete.)

5. Foliorum lobis arcè conduplicatis 6.
 5. Foliorum lobis lateralitèr incurvis 8.

CLAVIS ANALYTICA.

5

6. Foliis nervosis *J. albicans.*
 6. Foliis enervibus 7.
 7. Foliorum lobis obtusis *J. obtusifolia.*
 7. Foliorum lobis acutis *J. Dicksoni.*
 8. Foliorum lobis subæqualibus *J. minuta.*
 8. Foliorum lobis superioribus (seu anticis) minutissimis *J. exsecta.*

(Stipulata*.)

- H. { Foliis indivisis † 1.
 { Foliis divisis I.

1. Stipulis integris 2.
 1. Stipulis plùs minùsve laciniatis, emarginatis vel bifidis 5.
 2. Calyce foliis perichæatialibus immerso *J. scalaris.*
 2. Calyce exserto 3.
 3. Calyce inferiore, dimidiato, foliis subquadratis *J. polyanthos.*
 3. Calyce terminali, terete, foliis rotundatis vel ovatis 4.
 4. Foliis omnibus rotundatis *J. Taylora.*
 4. Foliis hìc illìc ovatis *J. anomala.*
 5. Foliis cuneiformibus (*stipulis bifidis*) *J. cuneifolia.*
 5. Foliis plùs minùsve ovatis (*stipulis lanceolatis vel emarginatis*) 6.
 6. Foliis omnibus integris, stipulis laciniatis (*cellulis minutis*) *J. viticulosa.*
 6. Foliis, hìc illìc, stipulisque emarginatis (*cellulis majusculis*) *J. Trichomanis.*

(Foliis divisis.)

- I. { Segmentis æqualibus 1.
 { Segmentis inæqualibus K.

(Segmentis æqualibus.)

1. Foliis bifidis 2.
 1. Foliis trifidis 6.
 2. Stipulis integris 3.
 2. Stipulis bifidis 4.
 3. Stipulis integerrimis, foliis valdè concavis, segmentis obtusis *J. albescens.*
 3. Stipulis dentatis, foliis planiusculis, segmentis acutis *J. stipulacea.*
 4. Stipularum segmentis integerrimis, calyce terete *J. Francisci.*
 4. Stipularum segmentis laciniatis, calyce triangulari 5.
 5. Foliis omnibus acutè bidentatis *J. bidentata.*
 5. Foliis plerumque obtusè bidentatis integrisque *J. heterophylla.*

* See note under *J. Sphagni* and *J. compressa*, in the division *Exstipulatæ*.

† *J. minutissima*, according to many of its leaves, might be supposed to belong to this division, but I have placed it in the *Jung. stip. fol. div. segm. inæqual. inf. involutis*, for reasons there given.

(Foliis trifidis.)

- | | | |
|----|-----------------------------------------------------|----------------------|
| | Foliis suprà concaviusculis, fructu terminali | <i>J. barbata.</i> |
| 6. | Foliis suprà convexis, fructu laterali | 7. |
| | Foliis subquadratis acutè tri-quadri-fidis | <i>J. reptans.</i> |
| 7. | Foliis ovatis, obtusè bi-tri-dentatis | <i>J. trilobata.</i> |

(Foliorum segmentis inæqualibus.)

- K. { Foliorum lobis inferioribus superioribus appressis 1.
 { Foliorum lobis inferioribus involutis. 8.

- | | | |
|----|------------------------------------------------|----|
| | Foliorum lobis inferioribus inflatis | 2. |
| 1. | Foliorum lobis inferioribus planiusculis | 4. |

(Segmentis inferioribus inflatis.)

- | | | |
|----|----------------------------------|------------------------|
| | Foliis spinuloso-dentatis | <i>J. Hutchinsiae.</i> |
| 2. | Foliis integerrimis | 3. |
| | Stipularum margine plano | <i>J. dilatata.</i> |
| 3. | Stipularum margine recurvo | <i>J. Tamarisci.</i> |

(Segmentis inferioribus planiusculis.)

- | | | |
|----|-----------------------------------------------------|------------------------|
| | Foliorum lobis multifidè divisis | 5. |
| 4. | Foliorum lobis integris | 7. |
| | Foliis planis | <i>J. tomentella.</i> |
| 5. | Foliis suprà valdè convexis | 6. |
| | Foliorum lobis stipulisque spinuloso-dentatis | <i>J. Woodsii.</i> |
| 6. | Foliorum lobis stipulisque ciliatis | <i>J. ciliaris.</i> |
| | Stipularum segmentis integerrimis | <i>J. platyphylla.</i> |
| 7. | Stipularum segmentis spinuloso-dentatis | <i>J. lævigata.</i> |

(Segmentis inferioribus involutis.)

- | | | |
|-----|----------------------------------|--------------------------|
| | Stipulis integerrimis | <i>J. Mackaii.</i> |
| 8. | Stipulis acutè emarginatis | 9. |
| | Foliis rotundatis | 10. |
| 9. | Foliis ovatis, acutis | 11. |
| | Foliis convexiusculis | <i>J. serpyllifolia.</i> |
| 10. | Foliis hemisphæricis | <i>J. minutissima*.</i> |
| | Foliis convexis | <i>J. hamatifolia.</i> |
| 11. | Foliis calyptriformibus. | <i>J. calyptrifolia.</i> |

* *J. minutissima* is, perhaps, an exception to this character, yet there is often a minute lobe, which, if not sensibly involute, is certainly not appressed to the larger one, and the affinity of the species has been a further inducement with me to place it here.

JUNGERMANNIARUM BRITANNICARUM

SYNOPSIS.

A. FOLIOSÆ.

† STIPULÆ NULLÆ*.

a. Foliis multifariam insertis.

1. *J. trichophylla*, caule repente, vagè ramoso: foliis undique imbricatis, hic illic fasciculatis, setaceis, articulatis, patentibus, rectis: fructu terminali; calycibus oblongis; ore contracto, ciliato. (TAB. VII.)

J. trichophylla. WAHL. *Lapp.* p. 385. MOHR, *Fl. Crypt. Germ.* p. 411.

This species is not uncommon in alpine countries, creeping over decaying leaves and Mosses. Mr. Turner has received specimens from Kamtchatka, which were gathered by Dr. Tilesius. Wahlenberg says that it is common throughout all Lapland, not only in the forests, but upon the loftiest alps; but he and Mohr appear to me to have fallen into an error in attributing to it stipules. "Stipulæ," the former observes, "ad latus inferius surculorum adsunt, foliis paullo breviores et minus patentes, de cætero iis simillimæ." *Lapp.* p. 385.

2. *J. setacea*, caule repente, subpinnatim ramoso: foliis undique imbricatis, binis, setaceis, articulatis, patentibus, incurvis: fructu ramis propriis brevibus terminali; calycibus oblongis; ore aperto, ciliato. (TAB. VIII. and *Suppl.* TAB. I.)

J. setacea. Engl. *Bot.* t. 2482.

* In this division I have brought *J. Sphagni* and *J. compressa*, upon which stipules are found only on the young shoots.

Dr. Taylor finds this species in Ireland with calyces, of which the perichætical leaves vary somewhat from our figure, tab. VIII.; and I have consequently figured them in the supplementary plate, where it will be seen that they are divided into three or four large and broad, unequal, slightly toothed segments. Dr. Mohr has the subjoined observation in his *Fl. Crypt. Germ.*, immediately following his division of *Hypnum*, “foliis diversimode vergentibus, binerviis v. subnerviis.” p. 349. “Hujus subdivisionis videtur, *Jung. setacea*, Web. *Spic.*, ex ipsius herb., fructu vero carens. Folia non gemina, quod auctor habet, sed laxius disposita, subpatentia, subulata, enervia omnino visa, integerrima. *Jungermannia* nullo modo est. Vix unquam teneriorem speciem vidimus.” Weber’s words are certainly at variance with this description, and are such as I think no one would hesitate in applying to our *Jungermannia*: “Surculi sunt tenuissimi, repentes, semiunciales, unciales, imo interdum longiores, ex albo virescentes. Folia alterna, gemina, setacea, brevia, non nisi lente accurate perspicenda.” WEB. *Spic.* p. 156.

3. *J. julacea*, caule erectiusculo, vagè ramoso, filiformi: foliis quadrifariis, ovatis, arcè imbricatis, erectis, acutè bifidis, segmentis lanceolatis, acuminatis, subserratis; perichæticalibus quadripartitis: fructu terminali; calycibus oblongis, supernè plicatis; ore aperto, dentato. (TAB. II.)

J. concinnata. WAHL. *Lapp.* p. 384. (excl. syn. LIGHTFOOTII.)

From the description, no less than from the reference to the figure of *J. julacea*, in *English Botany*, there is no doubt but Dr. Wahlenberg has quite mistaken the *J. concinnata* of Lightfoot, calling it *J. julacea*, and vice versâ the true *J. julacea*, *J. concinnata*; but why he has arranged our plant among the stipulated *Jungermanniæ* I cannot conceive. Indeed, in order to do this, he has been under the necessity of forming a division, which he defines, “Stipulis magnitudine et figurâ ferè foliorum:” this contains, besides our *J. julacea*, *J. setiformis* and *J. trichophylla*; on none of which have I ever seen any thing which can be looked upon as stipules. Even in the arctic regions, this species is confined to the highest mountains. “Habitat,” says Wahlenberg, “in terrâ nudâ limosâ irrigatâ juxta nivem perennem summarum alpium passim.”

4. *J. laxifolia*, caule erecto, simpliciusculo, filiformi: foliis distantibus, quadrifariis, erectopatentibus, ovatis, subcarinatis, acutè bifidis; (perichæticalibus similibus:) fructu terminali; calycibus oblongis, subplicatis; ore contracto, dentato. (TAB. LIX.)
5. *J. juniperina* caule erecto, flexuoso, subsimplice: foliis quadrifariis, falcato-secundis, lineari-lanceolatis, bipartitis; segmentis rectis, acuminatis: fructu terminali; calycibus ovatis, foliosis. (TAB. IV.)

I have gathered specimens of this species with male fructification, which is axillary. Perigonial leaves large, swollen at the base. Anthers spherical. (v. *Suppl.* TAB. I.)

6. *J. Hookeri*, caule erecto, subramoso: foliis undique imbricatis, ovatis v. oblongo-ovatis, hic illic lobatis angulatisve: fructu terminali; calyce nullo; calyptrâ magnâ, oblongâ, carnosâ, lævi. (TAB. LIV.)

b. Foliis bifariis.

× *Foliis indivisis.*

7. *J. asplenoides*, caule ascendente, ramoso: foliis obovato-rotundatis, ciliato-dentatis, subrecurvis; fructu terminali, lateraliq; calycibus oblongis, compressis, obliquis; ore truncato, subciliato. (TAB. XIV.)

J. asplenoides. WAHL. *Lapp.* p. 395. MOHR, *Fl. Crypt. Germ.* p. 420.

The male fructification of this species I found in woods at Berry Pomeroy Castle, Devonshire, in great abundance in March and April.

8. *J. spinulosa*, caule erecto, ramoso: foliis obovatis, recurvatis, hinc margine apiceque dentato-spinulosis: fructu laterali, axillariq; calycibus subrotundis, compressis; ore truncato, ciliato. (TAB. XIV.)

In Devonshire, particularly in the mountainous parts, *J. spinulosa* is plentiful; but in the plains of England, I know of only one habitat, near Rufus' stone in the New Forest, Hants., where it was gathered by Mr. Lyell. At Powerscourt waterfall, near Dublin, Dr. Taylor finds it with calyces, but never with capsules; and Mr. Lyell in the same state, on rocks above the summit of Stock-gill Force, Cumberland.

Another *var.*, which may be called *γ. foliis minutis apice bidentatis*, has been found by Mr. Lyell, at Keswick, and by the late Miss Hutchins and Mr. Mackay, in Ireland.

9. *J. decipiens*, caule erecto, flexuoso, subsimplice: foliis inferioribus minoribus, ovatis, integerrimis; superioribus rotundato-ovatis seu subquadratis, dente uno alterove sparso, spiniformi. (TAB. L.)

10. *J. Domniana*, caule erecto, subsimplice, filiformi, flexuoso: foliis arctè imbricatis, subhorizontalibus, oblongo-ovatis, concavis, apice bidentatis, falcato-secundis.— (TAB. XXXIX.)

11. *J. pumila*, caule ascendente, simpliciusculo: foliis elliptico-ovatis: fructu terminali; calycibus oblongo-ovatis, acuminatis; ore contracto, denticulato. (TAB. XVII.)

Mr. Lyell finds this at Kinnordy, Kerriemuir, Scotland; producing calyces in August.

12. *J. lanceolata*, caule procumbente, subsimplice: foliis patentibus, ovato-subrotundis: fructu terminali; calycibus oblongis, cylindraceis; apice depresso, plano; ore contracto, inciso-dentato. (TAB. XVIII.)

13. *J. cordifolia*, caule erecto, flexuoso, dichotomo: foliis erectis, concavis, cordatis, circumvolutis: fructu terminali axillariq; calycibus oblongo-ovatis, subplicatis; ore minuto, denticulato. (TAB. XXXII.)

14. *J. Sphagni*, caule procumbente, simpliciusculo; (elongationibus gemmiferis solummodò stipulatis!); foliis orbicularibus: fructu in ramis propriis terminali; calycibus oblongis, utrinque attenuatis; ore contracto, denticulato. (TAB. XXXIII. and Suppl. TAB. II.)

J. Sphagni. WAHL. *Lapp.* p. 394. MOHR, *Fl. Crypt. Germ.* p. 420.

Mr. Lyell found gemmæ in August at Stock-gill Force, near Ambleside, and I met with them abundantly in April, on mountains bordering on Dartmoor, Devonshire. The fructification I have been obliged to figure in the *Supplement*, where, at tab. II. fig. 1. is a gemmiferous plant, magn. 6; f. 2, extremity of the same, magn. 4; f. 3, gemmæ, magn. 2; f. 4, the same, magn. 1; f. 5, portion of a stem with the female fructification, magn. 6; f. 6, proper stalk to the fructification, with the perichætal leaves and calyx, magn. 4; f. 7, outer perichætal leaf; f. f. 8, 9, inner ditto, magn. 3; f. 10, a spiral filament, and f. 11, the seeds, both magn. 1.

Wahlenberg quotes, under *J. Sphagni*, the *J. scalaris* of Schmidel's *Diss. Jung.*, in which he is probably correct; for the gemmæ of that figure correspond sufficiently well with our plant. The Swedish author, however, appears to me to have confounded with this the *J. Taylori* of this work, with which a part of his description aptly agrees, "valdé mollis vel spongiosa, e reticulo laxiore facta," which is by no means the case with *J. Sphagni*.

15. *J. crenulata*, caule procumbente, ramoso: foliis rotundatis, marginatis: fructu terminali; calycibus obovatis, compressis, longitudinalitèr quadrangularibus; ore contracto, dentato. (TAB. XXXVII.)

This is plentiful on Burgh Common, near Yarmouth; and Mr. Lyell finds a small but elegant state of the plant at Kinnordy, bearing calyces in August. The male fructification resembles that of *J. scalaris*. It is figured in *Suppl.* tab. I.

16. *J. sphærocarpa*, caule ascendente, simplice: foliis orbiculatis: fructu terminali; calycibus oblongo-ovatis, cylindraceis, quadrifidis (capsulâ sphæricâ). (TAB. LXXIV.)

17. *J. hyalina*, caule ascendente, flexuoso, dichotomo: foliis rotundatis, subundulatis: fructu terminali; calycibus ovatis, angulatis; ore contracto, quadridentato.— (TAB. LXIII.)

18. *J. compressa*, caule erecto, diviso: foliis orbicularibus, summis reniformibus, appressis, (stipulis in innovationibus solummodò:) fructu terminali; calycibus foliis immersis, oblongis, carnosius; ore aperto, quadridentato. (TAB. LVIII.)

Plentiful in Switzerland, particularly in the valley of Guttanen, near the Grimsel.

× × *Foliis emarginatis vel bifidis, segmentis æqualibus.*

19. *J. emarginata*, caule erecto ramoso: foliis laxè imbricatis, patentibus, obcordatis, emarginatis: fructu terminali; calycibus ovatis, dentatis, foliis immersis. (TAB. XXVII.)

J. emarginata. WAHL. *Lapp.* p. 392. MOHR, *Crypt. Germ.* p. 421.

20. *J. concinnata*, caule erecto, ramoso : foliis arctissimè imbricatis, erectis, concavis, ovatis, obtusis, emarginatis : fructu terminali ; calycibus nullis. (TAB. III.)

J. julacea. WAHL. *Lapp.* p. 392. MOHR, *Crypt. Germ.* p. 421.

21. *J. orcadensis*, caule erecto, simplice : foliis arctè imbricatis, erectis v. patentibus, cordato-ovatis, marginibus recurvis. (TAB. LXXI.)

This I have found abundantly in Switzerland, but always barren.

22. *J. inflata*, caule procumbente, simplice vel ramoso : foliis subrotundis, concavis, acutè bifidis ; segmentis rectis, obtusis : fructu terminali ; calycibus pyriformibus ; ore contracto, dentato. (TAB. XXXVIII.)

J. inflata. WAHL. *Lapp.* p. 393.

Abundant in fruit about Torquay, and Dartmouth, Devonshire, in the month of April.

23. *J. excisa*, caule prostrato, simpliciusculo : foliis patentibus, subquadratis, profundè emarginatis : fructu terminali ; calycibus oblongis ; ore plicato, dentato. (TAB. IX.)

J. excisa. *Engl. Bot.* t. 2496.

J. Funckii. MOHR, *Crypt. Germ.* p. 492. WAHL. *Lapp.* p. 393. SCHWAEGR. *Prodr. Musc. Hep.* p. 27. cum Ic.

Mr. Francis finds this plant, in December, with gemmæ of a brownish color, angular, scattered in small loose clusters at the edges of the leaves, and likewise with calyces shorter and broader than in the specimen figured at tab. ix., and I have consequently thought them deserving of a place in a supplementary plate. (See *Suppl. t. II.*, where at f. 1, is a gemmiferous plant, magn. 6 ; f. 2, two leaves of the same, shewing the erose margins of the leaves, whence the gemmæ have fallen, magn. 6 ; f. 3, particles of gemmæ, magn. 1 ; f. f. 4, 5, calycine plants, magn. 6, in which the calyces are shorter than is usual in this species ; f. 6, leaf of the same, magn. 4.)

24. *J. ventricosa*, caule prostrato, subramoso : foliis patentibus, subquadratis, obtusè emarginatis, lateribus incurvis : fructu terminali ; calycibus oblongis ; ore contracto, plicato, dentato. (TAB. XXVIII.)

J. ventricosa. *Engl. Bot.* t. 2568.

25. *J. Turneri*, caule procumbente, flexuoso, setellatim ramoso : foliis latè ovatis, acutè bipartitis ; segmentis subconduplicatis, spinuloso-dentatis : fructu terminali ; calycibus lineari-oblongis, longitudinalitèr plicatis ; ore quoque plicato. (TAB. XXIX.)

26. *J. bicuspidata*, caule procumbente, stellatim ramoso : foliis subquadratis, acutè bifidis ; segmentis acutis, rectis, integerrimis : fructu terminali ; calycibus oblongis, plicatis ; ore dentato. (TAB. XI.)

J. bicuspidata. MOHR, *Crypt. Germ.* p. 424. WAHL. *Lapp.* p. 594.

The anthers of this species I have figured in the *Suppl.* tab. iv.: they are axillary, two or three together in a swollen perigonial leaf, and spherical: footstalk short, white.

27. *J. byssacea*, caule procumbente, stellatim ramoso: foliis subquadratis, obtusè bifidis; segmentis acutis: fructu terminali; calycibus oblongis, plicatis; ore dentato. (TAB. XII.)

J. bicuspidata. var. β . WAHL. *Lapp.* p. 394.

Both Mohr and Wahlenberg consider this as merely a variety of *J. bicuspidata*, in which opinion they may possibly be correct; though the reticulation is strikingly different, which did not escape the observation of the last-mentioned author.

28. *J. connivens*, surculo procumbente, stellatim ramoso: foliis orbicularibus, concavis, apice lunulari-emarginatis: fructu in ramis propriis, brevissimis, centralibus terminali; calycibus oblongo-ovatis; ore ciliato. (TAB. XV.)

J. connivens. WAHL. *Fl. Lapp.* p. 393.

29. *J. curvifolia*, surculo procumbente, stellatim ramoso: foliis subrotundis, valde concavis, bifidis; segmentis acuminatis, incurvatis: fructu in ramis propriis, brevissimis, centralibus terminali; calycibus oblongis, subplicatis; ore dentato. (TAB. XVI.)

J. curvifolia. MOHR, *Crypt. Germ.* p. 423.

J. birostrata. SCHLEICH. *Cent.* 3. n. 59.

Having, since the publication of tab. XVI., received more perfect calyces of this species from Ireland, I have figured one in the first supplementary plate, where it will be seen that the perichætal leaves are serrated.

× × × *Foliis tri-quadri-fidis, segmentis æqualibus.*

30. *J. capitata*, caule prostrato, simpliciusculo: foliis rotundato-quadratis, inferioribus bifidis, reliquis tri-quadri-fidis: fructu terminali: calycibus oblongo-ovatis, subplicatis; ore contracto, dentato. (TAB. LXXX.)

31. *J. incisa*, caule prostrato, depresso, simpliciusculo: foliis subquadratis, undulatis, subtrifidis, segmentis inæqualibus, hinc illic denticulatis: fructu terminali; calycibus obovatis. (TAB. X.)

32. *J. pusilla*, caule procumbente, subsimplice: foliis horizontalibus, quadratis, undulatis, obtusè bi-tri-crenatis: fructu terminali; calycibus campanulatis. (TAB. LXIX.)

J. pusilla. MOHR, *Crypt. Germ.* p. 429.

33. *J. setiformis*, caule erecto, subsimplice: foliis bifariis, arctè imbricatis, erectis, quadratis, quadrifidis; angulis inferioribus margine hic illic spinuloso-dentatis: fructu fructu terminali lateraliq; calycibus oblongis, plicatis; ore aperto. (TAB. XX.)

J. setiformis. MOHR, *Crypt. Germ.* p. 415. WAHL. *Lapp.* p. 385.

This plant seems peculiar to northern latitudes. It has never been found in the Alps, or any part of the south of Europe; nor, in the British dominions, any where but in Scotland. I have seen specimens from Kamtschatka; and Wahlenberg says, "in saxis siccis Lapponiæ totius tam sylvaticæ ac alpinæ ubique:" but this author never appears to have met with the fructification. Mohr says of it, "Fructificatio speciei nullo quoque botanicorum usque nunc observata, singula adest in exemplo *J. concat.* Thunbergiano."

× × × × *Foliis bifidis; segmentis inæqualibus, conduplicatis.*

34. *J. nemorosa*, caule erecto, subdichotomo: foliis inæqualitèr bilobis, semibifidis, dentato-ciliatis; lobis conduplicatis; inferioribus majoribus, obovatis; superioribus subcordatis, obtusis: fructu terminali; calycibus oblongis, incurvatis, compressis; ore truncato, dentato-ciliato. (TAB. XXI.)

J. nemorosa. MOHR, *Crypt. Germ.* p. 427.

35. *J. planifolia*, caule erecto, subsimplice: foliis inæqualitèr bilobis, ad basin usque bipartitis, dentato-ciliatis; lobis conduplicatis; inferioribus majoribus, ovatis; superioribus cordatis, obtusis. (TAB. LXVII.)

Specimens of this plant, which I have lately had the opportunity of examining, have satisfied me that it ought to enter into this division; and, indeed, the difference between it and *J. nemorosa* is so slight, that I am almost inclined to consider it a variety, though a very remarkable one, of that species.

36. *J. umbrosa*, caule erectiusculo, subramoso: foliis inæqualitèr bilobis; lobis conduplicatis, apice serratis, acutis; inferioribus majoribus ovatis; superioribus rotundato-ovatis: fructu terminali; calycibus oblongis, incurvatis, compressis; ore truncato, integerrimo. (TAB. XXIV.)

Dr. Mohr considers this species as a variety of *J. resupinata*, but to me it appears much more allied to *J. nemorosa*, from which it is scarcely to be distinguished, but by its smaller size and serrated, not dentato-ciliate, leaves. Gemmæ are not rare on this species in the summer months. They are of an ovate and somewhat angular figure, collected into an oblong brown mass, at the ends of the terminal leaves. (See *Suppl.* TAB. III.)

37. *J. undulata*, caule erecto, subdichotomo: foliis inæqualitèr bilobis, undulatis, integerimis; lobis sub-rotundatis, conduplicatis; inferioribus majoribus: fructu terminali; calycibus oblongis, incurvatis, compressis; ore truncato, integerrimo. (TAB. XXII.)

J. undulata. MOHR, *Crypt. Germ.* p. 426. WAHL. *Lapp.* p. 391.

38. *J. resupinata*, caule procumbente, simpliciusculo : foliis rotundatis, subæqualitèr bilobis, integerrimis ; lobis conduplicatis ; fructu terminali : calycibus oblongis, incurvatis, compressis ; ore truncato, denticulato. (TAB. XXIII.)

J. resupinata. MOHR, *Crypt. Germ.* p. 427. WAHL. *Lapp.* p. 591.

J. compacta. ROTH, *Fl. Germ.* p. 403.

The last synonym I am enabled to subjoin through the kindness of my friend, Dr. Swartz, who sent me authentic specimens received by him from Germany. It is, perhaps, not an uncommon species in this country, Mr. Lyell having found it both in Sussex and in the north of Scotland.

39. *J. albicans*, caule erecto, subdiviso : foliis inæqualitèr bilobis ; lobis conduplicatis, medio pellucidis, apice serratis ; inferioribus majoribus, subacinaciformibus ; superioribus oblongo-ovatis, acutis : fructu terminali ; calycibus obovatis, cylindraceis ; ore contracto, dentato. (TAB. XXV.)

J. albicans. MOHR, *Crypt. Germ.* p. 428.

40. *J. obtusifolia*, caule ascendente, simplice : foliis inæqualitèr bilobis : lobis conduplicatis, obtusis, integerrimis ; inferioribus majoribus, subacinaciformibus ; superioribus ovatis : fructu terminali ; calycibus obovatis ; ore contracto, dentato. (TAB. XXVI.)

41. *J. Dicksoni*, caule ascendente, subsimplice : foliis inæqualitèr bilobis ; lobis conduplicatis ; inferioribus majoribus ; utrisque angustè ovatis, subintegerrimis, acutis : fructu terminali ; calycibus ovatis, plicatis ; ore contracto, dentato. (TAB. XLVIII.)

J. taxifolia. WAHL. *Lapp.* p. 390. tab. xxv. f. 2. a. c ?

I quote this synonym with a note of doubt, solely because the author says, "folia obtusiuscula," which is not the case in *J. Dicksoni*.

42. *J. minuta*, caule erecto, subdichotomo : foliis horizontalitèr patentibus, subconduplicatis ; superioribus æqualitèr, inferioribus inæqualitèr bilobis ; omnibus acutiusculis : fructu terminali ; calycibus obovatis, apice parùm plicatis : ore contracto, denticulato. (TAB. XLIV.)

J. minuta. WAHL. *Lapp.* p. 393.

J. bicornis. MOHR, *Crypt. Germ.* p. 423.

43. *J. exsecta*, caule prostrato, simpliciusculo : foliis inæqualitèr bilobis ; lobis subconduplicatis ; inferioribus majoribus, ovatis, acutis, concavis, apice sæpè bidentatis ; superioribus minutis, denti-formibus. (TAB. XIX.)

J. exsecta. MOHR, *Crypt. Germ.* p. 428.

Mr. Lyell has gathered, in the New Forest, Hants, individuals of this plant with young and very imperfectly formed calyces. They are terminal, or, from the shooting forth of an innovation, lateral, obovate, with the unexpanded mouth lateral and toothed. The peri-

chæatial leaves are large, at the extremity trifid and quadrifid, having the segments jagged or lacinate. (See *Suppl.* tab. 1. f. 1, *J. exsecta*, magn. 6; f. 2, *young calyx and perichæatial leaves*, magn. 4; f. 3, *calyx removed*, magn. 2; f. 4, *perichæatial leaf*, magn. 2.)

44. *J. cochleariformis*, caule procumbente, subsimplice: foliis supernè imbricatis, inæqualitèr bilobis, conduplicatis; lobis superioribus majoribus, convexis, apice bifidis serratisque; inferioribus saccatis. (TAB. LXVIII.)

In the north and north-western parts of Ireland, I have gathered it even more abundantly than in Scotland, but always without fructification.

45. *J. complanata*, surculo repente, vagè ramoso: foliis distichis, supernè imbricatis, inæqualitèr bilobis; lobis superioribus majoribus, orbiculatis; inferioribus ovatis, appressis, planis: fructu terminali; calycibus oblongis, compressis, truncatis. (TAB. LXXXI.)

†† STIPULATÆ.

a Foliis integris v. rarius hinc illinc emarginatis.

46. *J. anomala*, caule procumbente, simplice: foliis orbicularibus; his rotundato-ovatis, illis ovato-acuminatis; stipulis latè subulatis. (TAB. XXIV.)

47. *J. Taylora*, caule erecto, subsimplice: foliis omnibus rotundatis; stipulis latè subulatis: fructu terminali; calycibus ovatis, apice compressis, truncatis, bilabiatis. (TAB. LVII.)

48. *J. scalaris*, caule repente, simplice: foliis rotundatis, concavis, integris emarginatisque; stipulis latè subulatis: fructu terminali; calyce foliis immerso. (TAB. LXI.)

J. scalaris. MOHR, *Crypt. Germ.* p. 419.

Mohr is quite mistaken in supposing our *J. pumila* to be the same as *J. scalaris*. Their calyces are totally different.

49. *J. polyanthos*, caule procumbente, subramoso: foliis horizontalibus, rotundato-quadratis, planis, integris emarginatisque; stipulis oblongis, bifidis: fructu in ramis propriis ex parte caulis inferiore egredientibus, laterali; calycibus calyptrâ dimidio brevioribus, bilabiatis, laciniatis. (TAB. LXII.)

J. polyanthos. MOHR, *Crypt. Germ.* p. 418.

50. *J. cuneifolia*, caule repente, simplice: foliis remotiusculis, cuneiformibus, integerrimis, vel apice obtusissimè emarginatis; stipulis minutis, ovatis, bifidis. (TAB. LXIV.)

51. *J. viticulosa*, caule procumbente, ramoso : foliis horizontalibus, planis, ovatis, integris ; stipulis latè ovatis, dentato-laciniatis : fructu laterali ; calycibus subterraneis, oblongis, carnosus ; ore squamis foliaceis fimbriato. (TAB. LX.)

J. viticulosa. MOHR, *Crypt. Germ.* p. 417 ?

The imperfect description that Mohr has given of this species will not allow me to quote him with certainty under our plant.

52. *J. Trichomanis*, caule repente, subsimplice : foliis horizontalibus, convexis, ovatis, integris, emarginatisque ; stipulis rotundatis, lunulari-emarginatis : fructu laterali ; calycibus subterraneis, oblongis, carnosus, hirsutis ; ore crenato. (TAB. LXXIX.)

b Foliis bi- seu tri-fidis, segmentis æqualibus.

53. *J. bidentata*, caule procumbente, ramoso : foliis latè ovatis, decurrentibus, apice bifidis, segmentis valdè acutis, integerrimis ; stipulis bi-tri-fidis laciniatisque : fructu terminali ; calycibus oblongis, subtriangularibus ; ore laciniato. (TAB. XXX.)

J. bidentata. MOHR, *Crypt. Germ.* p. 408.

In the supplementary plate, tab. III., I have figured a variety of *J. bidentata*, as I have now reason to think it is, which is hinted at under the account of *J. stipulacea*, with the mss. name of *J. Bantriensis*. The leaves precisely accord with those of my var. β . ; but the stipules are much less divided, and the capsule, which is short and broad, and scarcely at all triangular, rises from the bare stem, unprotected by any perichaetial leaves. It was found by the late Miss Hutchins, near Bantry. (At f. 1, is a portion of the stem, with the calyx, magn. 6 ; f. 2, a portion of the stem, shewing the stipules, magn. 6 ; and f. f. 3, 3, 3, stipules.)

54. *J. heterophylla*, caule repente, ramoso : foliis rotundato-ovatis, decurrentibus ; apice rarius acutè, plerumque obtusè emarginatis integrisve ; stipulis bi-tri-fidis, hìc illic sublaciniatis : fructu terminali ; calycibus ovatis, obtusè triangularibus ; ore laciniato. (TAB. XXXI.)

J. heterophylla. MOHR, *Crypt. Germ.* p. 407.

55. *J. stipulacea*, caule procumbente, simplice : foliis rotundatis, apice acutè emarginatis, segmentis acutis, rectis ; stipulis magnis, ovatis, acuminatis, prope basin margine utrinque uni-dentato : fructu laterali ; calycibus obovatis, apice subplicatis ; ore contracto, obtusè dentato. (TAB. XLI.)

56. *J. Francisci*, caule erectiusculo, simplice vel ramoso : foliis ovatis, concavis, acutè emarginatis ; stipulis minutis, ovatis, bifidis : fructu in ramis propriis terminali ; calycibus oblongo-cylindraceis, parùm plicatis ; ore dentato. (TAB. XLIX.)

57. *J. barbata*, caule procumbente, simpliciusculo : foliis rotundato-quadratis, tri-quadrifidis ; stipulis lanceolatis, acutè bifidis, margine laciniatis : fructu terminali ; calycibus ovatis ; ore contracto, dentato. (TAB. LXX.)
58. *J. albescens*, caule repente, ramoso : foliis valdè concavis, propemodùm hemisphæricis, emarginatis ; stipulis ovato-lanceolatis, obtusis : fructu in ramis brevibus terminali ; calycibus oblongo-ovatis ; ore dentato. (TAB. LXXII. and *Suppl.* TAB. IV.)

I am happy to be able to offer a figure of the fructification of this species in the supplementary plate above quoted. The *calyces* are oblongo-ovate, with a contracted mouth, and dentate ; situated upon short, lateral branches, and surrounded at the base with *perichæatial leaves*, which scarcely differ from the rest but in being larger. The *capsule* is ovate, splitting into four equal valves. *Seeds* and *spiral filaments* deep brown. The plant is extremely common on the more elevated Alps of Switzerland, and I met with it, bearing capsules, as well upon the Grimsel as upon the Susten, near the limits of perpetual snow. It is from the last-mentioned spot that the specimen here figured was gathered. (Fig. 1, *J. albescens*, magn. 6 ; f. 2, *portion of the stem, shewing the stipules*, magn. 4 ; f. 3, *seeds and spiral filaments*, magn. 1.)

59. *J. reptans*, caule repente, stellatim ramoso : foliis supernè imbricatis, subquadratis, incurvis, acutè quadridentatis ; stipulis lato-quadratis, quadridentatis : fructu radicali ; calycibus oblongis, plicatis ; ore dentato. (TAB. LXXV.)
60. *J. trilobata*, caule repente, flexuoso, ramoso : foliis supernè imbricatis, ovatis, convexis, obtusè tridentatis ; stipulis lato-subquadratis, crenatis : fructu e parte caulis inferiore egrediente ; calycibus oblongis, subacuminatis ; ore lateralitè fissio.— (TAB. LXXVI.)

c. Foliis bifidis ; segmentis inæqualibus, conduplicatis.

× *Segmentis inferioribus, seu minoribus, planis.*

61. *J. platyphylla*, caule procumbente, pinnatim ramoso : foliis inæqualitè bilobis ; lobis superioribus rotundato-ovatis, subintegerrimis ; inferioribus stipulisque ligulatis, integerrimis : fructu laterali ; calycibus ovatis, compressis, ore truncato, incisoserrato, hinc longitudinalitè fissis. (TAB. XL. and *Suppl.* TAB. III., where the roots are represented fastigate, as described at TAB. XL.)

J. platyphylla. MOHR, *Crypt. Germ.* p. 397. WAHL, *Lapp.* p. 388.

62. *J. lævigata*, caule procumbente, vagè bipinnatim ramoso : foliis inæqualitè bilobis, spinuloso-dentatis ; lobis superioribus rotundato-ovatis ; inferioribus ligulatis ; stipulis oblongo-quadratis, spinuloso-dentatis. (TAB. XXXV.)

J. lævigata. MOHR, *Crypt. Germ.* p. 398.

63. *J. ciliaris*, caule procumbente, pinnatim ramoso: foliis valdè convexis, inæqualitèr bilobis; lobis lobulisque ovatis, bipartitis, longè tenuitèrque ciliatis; stipulis subquadratis, apice quadri-quinque-lobis, longissimè ciliatis: fructu laterali; calycibus obovatis; ore contracto, dentato. (TAB. LXV.)
64. *J. Woodsii*, caule procumbente, bi-tri-pinnato: foliis valdè convexis, inæqualitèr bilobis; lobis superioribus bipartitis, spinuloso-dentatis; inferioribus minutissimis, oblongis, subintegerrimis; stipulis magnis, ovatis, bipartitis, spinuloso-dentatis; basi utrinque calcaratis. (TAB. LXVI.)
65. *J. tomentella*, caule erectiusculo, bipinnato: foliis planiusculis, inæqualitèr bilobis, capillari-multifidis; lobis superioribus bipartitis; inferioribus minutis; stipulis subquadratis, laciniatis: fructu axillari; calycibus oblongis, cylindræeis, hirsutis; ore aperto. (TAB. XXXVI.)

J. tomentella. MOHR, *Crypt. Germ.* p. 414.

× × *Segmentis inferioribus, seu minoribus, involutis.*

66. *J. Mackaii*, caule repente, vagè ramoso: foliis inæqualitèr bilobis; lobis superioribus rotundatis; inferioribus minutis, involutis; stipulis magnis, rotundatis, obcordatis: fructu laterali terminalique; calycibus obcordatis, depressis, triangularibus; ore contracto, elevato, dentato. (TAB. LIII.)
67. *J. serpyllifolia*, caule repente, vagè pinnatim ramoso: foliis inæqualitèr bilobis; lobis superioribus rotundatis; inferioribus minutis, involutis; stipulis rotundatis, acutè bifidis: fructu laterali; calycibus latè obovatis, pentagonis; ore contracto, elevato, subdentato. (TAB. XLII.)
68. *J. hamatifolia*, caule repente, vagè ramoso; foliis inæqualitèr bilobis; lobis superioribus ovatis, acuminatis, apice sæpissimè curvatis; inferioribus involutis; stipulis ovatis, acutè bifidis: fructu laterali; calycibus obovatis, pentagonis; ore contracto, elevato, dentato. (TAB. LI.)

A leaf of *var. β.*, alluded to in the description, is represented in *Suppl. tab. III.*

69. *J. minutissima*, caule repente, vagè ramoso: foliis inæqualitèr bilobis; lobis superioribus hemisphæricis; inferioribus minutis, ferè obsoletis: stipulis ovato-rotundatis, bifidis: fructu laterali; calycibus obovato-rotundatis, pentagonis; ore contracto, parùm dentato. (TAB. LII.)
70. *J. calyptrifolia*, caule repente, ramoso: foliis inæqualitèr bilobis; lobis superioribus majoribus, calyptriformibus; inferioribus obtusè quadratis, circumvolutis: fructu laterali; calycibus oblongis, apice depresso, plano, quinquedentato; ore minuto, contracto. (TAB. XLIII.)

× × × *Segmentis inferioribus, seu minoribus, saccatis.*

71. *J. Hutchinsiae*, caule repente, ramoso: foliis inæqualitèr bilobis; lobis superioribus ovatis, spinuloso-serratis; inferioribus minutis, saccatis, basi sæpissimè unidentatis; stipulis rotundato-ovatis, subserratis, acutè bifidis: fructu laterali; calycibus obcordatis, triangularibus. (TAB. I.)

Mr. Mackay has found this species in the south of Ireland, Sir T. Gage upon mountains about Killarney, and Mr. Lyell upon rocks, near Lowdore, Cumberland.

72. *J. dilatata*, caule repente, vagè ramoso: foliis inæqualitèr bilobis; lobis superioribus subrotundis; inferioribus rotundatis, saccatis; stipulis rotundatis, planis, emarginatis: fructu terminali; calycibus obcordatis, tuberculatis, triangularibus. (TAB. V.)

J. dilatata. MOHR, *Crypt. Germ.* p. 402. WAHL. *Lapp.* p. 388.

73. *J. Tamarisci*, caule repente, pinnatim ramoso: foliis inæqualitèr bilobis; lobis superioribus ovato-rotundatis; inferioribus minutis, obovatis, saccatis; stipulis subquadratis, emarginatis, marginibus revolutis: fructu in ramis brevibus terminali; calycibus obovatis, lævibus, triangularibus. (TAB. VI.)

J. tamariscifolia. MOHR, *Crypt. Germ.* p. 398. WAHL. *Lapp.* p. 387.

B. FRONDOSÆ.

a. Enerves.

74. *J. pinguis*, fronde oblongâ, decumbente, enervi, carnosâ, suprâ planiusculâ, subtùs tumidâ, vagè ramosâ, margine sinuatâ: fructu ex inferiore parte prope marginem egrediente; calycibus brevissimis; ore dilatato, fimbriato; calyptrâ exsertâ, oblongo-cylindraceâ, lævi. (TAB. XLVI.)

J. pinguis. MOHR, *Crypt. Germ.* p. 432.

75. *J. multifida*, fronde lineari, enervi, carnosâ, compressâ, pinnatim ramosâ: fructu marginali; calycibus brevissimis; ore dilatato, fimbriato: calyptrâ exsertâ, oblongo-cylindraceâ, tuberculatâ. (TAB. XLV.)

J. multifida. MOHR, *Crypt. Germ.* p. 433.

J. palmata. HEDW. *Th. ed. 2.* p. 159. t. 20. f. 7. HOFFM. *Germ.* p. 90. MOHR, *Crypt. Germ.* p. 433. ROTH, *Germ.* III. p. 415.

After a careful examination of numberless specimens, upon their native mountains, of what foreign authors have called by the name of *J. palmata*, I can see no reason whatever for separating it from *J. multifida*, nor even for considering it a variety of that plant.

When *J. multifida* grows on decaying trunks of trees, and is smaller than usual, it is *J. palmata* : in such a state Dr. Taylor lately found it in the neighborhood of Dublin, and sent it me under that name.

I know not what were Dr. Mohr's ideas of *J. palmata* as a species, when he says that Schmidel's figure (in his *Icones*), t. 55, f. f. 16, xvii., belongs to it, and all the rest of the plate to *J. multifida*.

b. Frondes nervo præditæ.

× *Calyce simplice.*

76. *J. Blasia*, fronde oblongâ, submembranaceâ, dichotomâ, costatâ, infrâ sparsim squamosâ; squamis dentatis : fructu e costæ parte superiore egrediente; calyce calyptrâque intrafrondosis. (TAB. LXXXII. LXXXIII. LXXXIV.)

77. *J. epiphylla*, fronde oblongâ, submembranaceâ, vagè divisâ, obsoletè costatâ, margine integerrimo, vel sublobato sinuatoque : fructu e superiore parte frondium prope apicem egrediente; calycibus subcylindraceis, plicatis; ore parùm dilatato, incisodentato; calyptrâ exsertâ, lævi. (TAB. XLVII.)

J. epiphylla. MOHR, *Crypt. Germ.* p. 431. WAHL. *Lapp.* p. 397.

78. *J. furcata*, fronde lineari, dichotomâ, membranaceâ, costatâ, suprâ lævi, subtùs margineque plùs minùsve pilosâ : fructu ex inferiore parte costæ egrediente; calycibus bilobis, conduplicatis, margine ciliato; calyptrâ obovatâ, hispidâ. (TAB. LV. LVI.)

J. furcata. MOHR, *Crypt. Germ.* p. 396. WAHL. *Lapp.* p. 596.

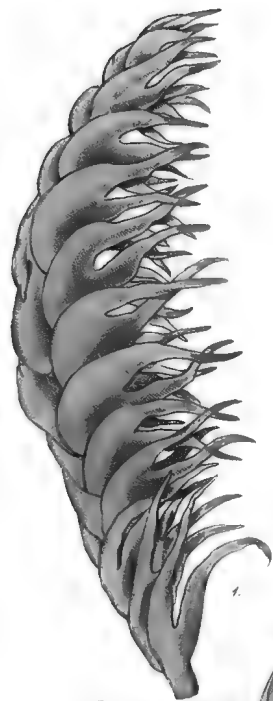
79. *J. pubescens*, fronde lineari, dichotomâ, membranaceâ, costatâ, undique pubescente. (TAB. LXXIII.)

× × *Calyce duplice.*

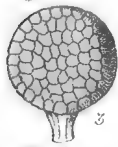
80. *J. Lyellii*, fronde oblongâ, subramosâ, tenerâ, costatâ, margine subintegerrimo : fructu e superiore parte frondium; calyce duplice; exteriore perbreui, margine laciniatodentato; interiore longè exserto, cylindraceo, subplicato; calyptrâ calycem subexcedente. (TAB. LXXVII.)

81. *J. hibernica*, fronde oblongâ, dichotomâ, tenerâ, costatâ, margine integerrimo : fructu e superiore parte frondium; calyce duplice; exteriore perbreui, laciniato; interiore longè exserto, ovato-cylindraceo, subplicato; calyptrâ calyce interiore multò brevior. (TAB. LXXVIII. and *Suppl.* TAB. IV. f. 1, *J. hibernica*, nat. size; f. 2, *portion of ditto*, magn. 6; f. 3, *calyces dissected*, magn. 4; f. 4, *capsule*, magn. 3; f. 5, *capsule*, magn. 3; f. 6, *seeds and spiral filaments*.)





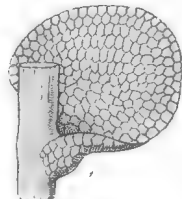
S. juniperina



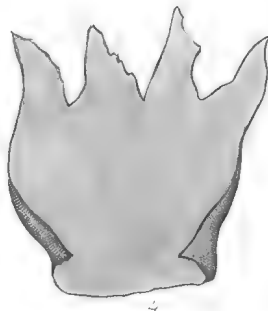
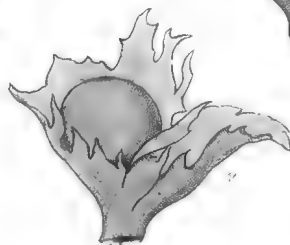
S. sinensis



S. sinensis



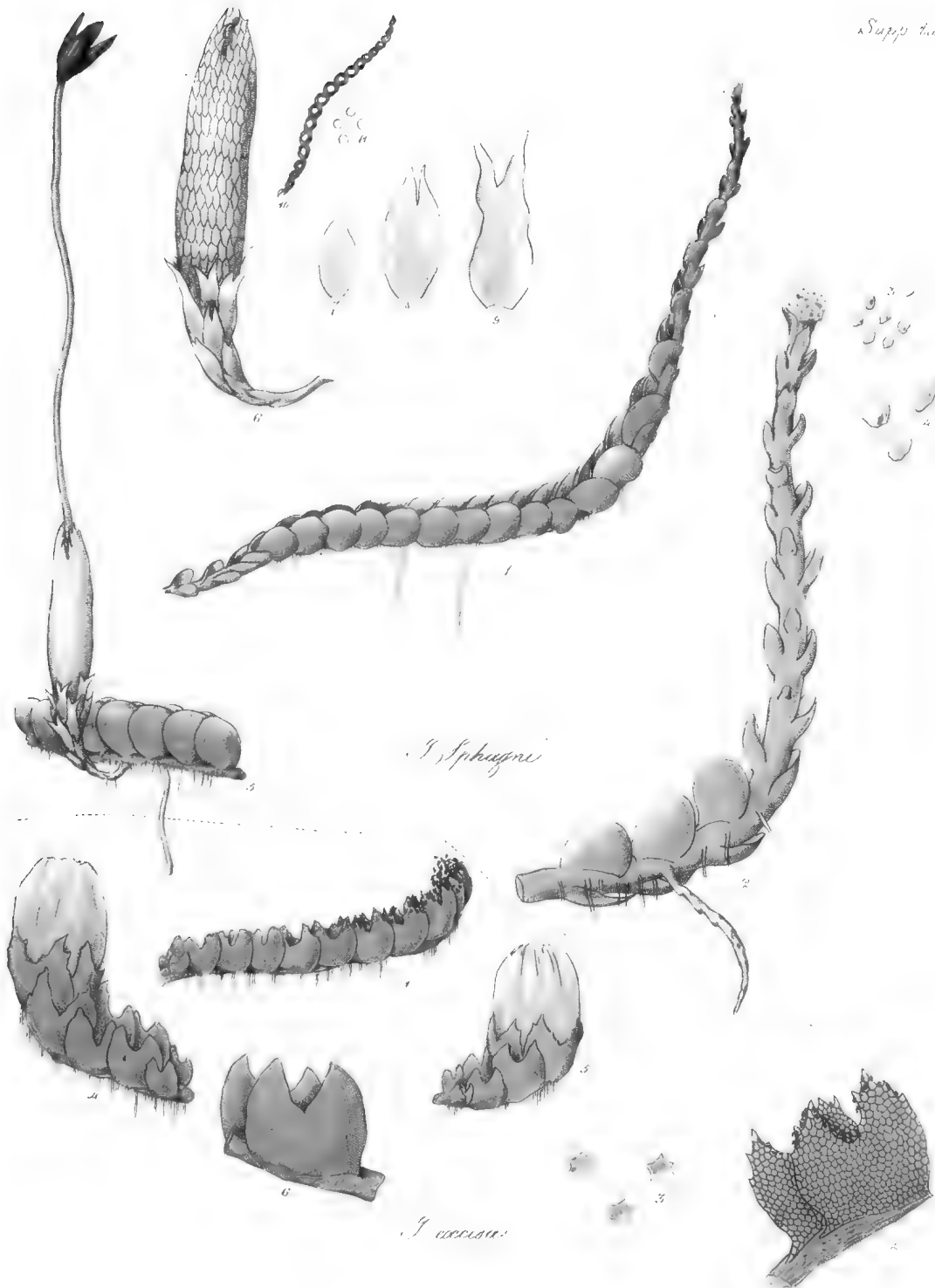
S. crinitata

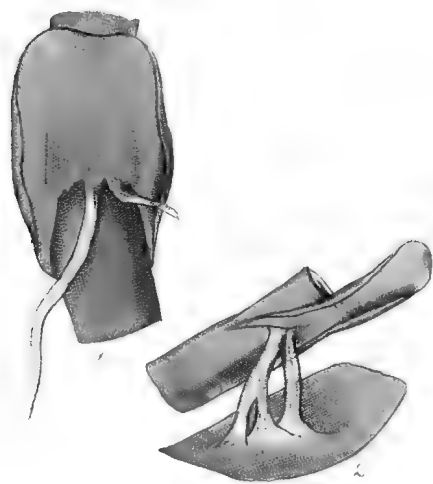


S. sinensis

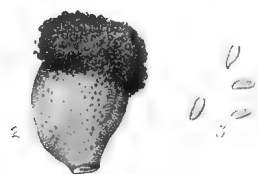
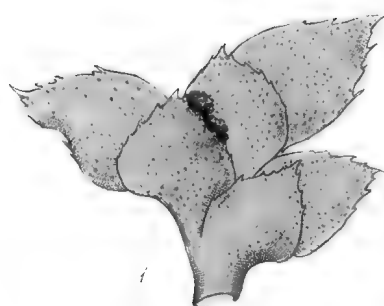


Supp. tab. II





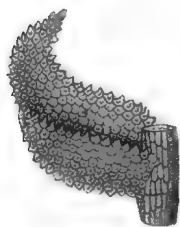
Iplarisphylla



Iambrosia

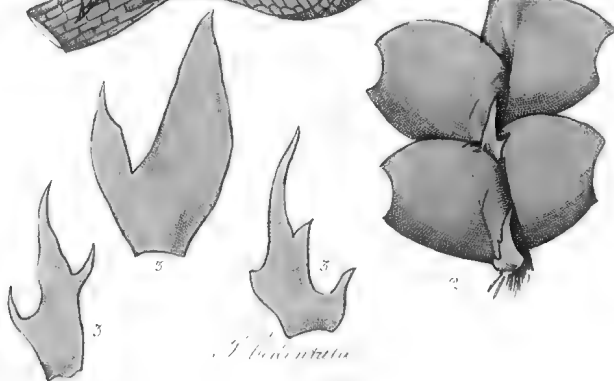
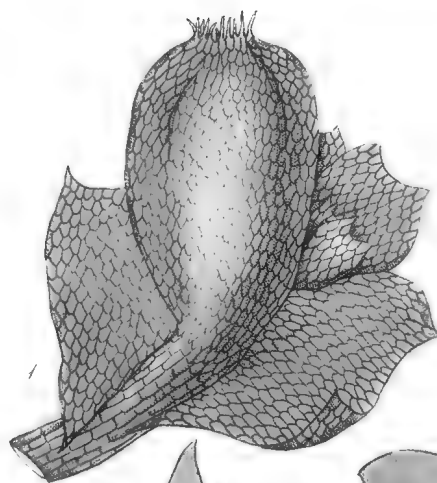


I. monaciformis



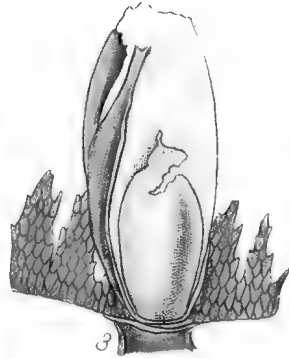
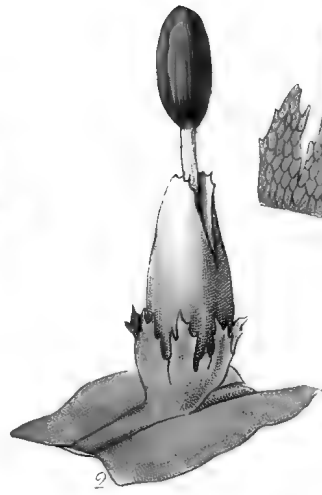
I. monaciformis

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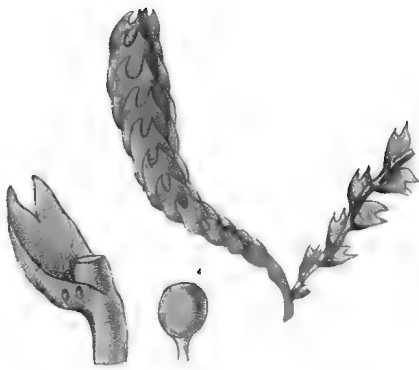


I. monaciformis

Suppl. 1. 11.



Thurmannia



Thurmannia



Thurmannia

INDEX

OF

THE SPECIES AND SYNONYMS.

Those in italics are the Synonyms. The first column refers to the pages of the Synopsis, at the end of the Introduction ; the second to the Plate and accompanying Description, in the body of the work.

<i>Blasia pusilla</i>	82—84	<i>J. compacta</i>	14
<i>J. adunca</i> , DICKS.	4	<i>J. complanata</i>	15 81
<i>J. albescens</i> 17	72	<i>J. compressa</i>	10 58
<i>J. albicans</i> 14	25	<i>J. concatenata</i> , LINN.	20
<i>J. angulosa</i> , DICKS.	69	<i>J. concinnata</i>	11 3
<i>J. anomala</i> 15	34	<i>J. concinnata</i>	8
<i>J. aquatica</i> , SCHRANK.	62	<i>J. connivens</i>	12 15
<i>J. asplenioides</i> 9	13	<i>J. cordifolia</i>	9 32
<i>J. barbata</i> 17	70	<i>J. crenulata</i>	10 37
<i>J. bicornis</i> , Fl. Dan.	11	<i>J. cuneifolia</i>	15 64
<i>J. bicornis</i> , HOFFM. 14	28	<i>J. cupressiformis</i> , LAM.	6
<i>J. bicrenata</i> , SCHMID.	38	<i>J. cupressiformis</i> , β . LAM.	40
<i>J. bicuspidata</i> 11	11	<i>J. curvifolia</i>	12 16
<i>J. bicuspidata</i> , SM.	31	<i>J. decipiens</i>	9 50
<i>J. bidentata</i> 16	30	<i>J. dichotoma</i> , SCHLEICH.	70
<i>J. bidentata</i> , var. 2. WITH.	38	<i>J. Dicksoni</i>	14 48
<i>J. bidentata</i> , SCHMID.	28	<i>J. dilatata</i>	19 5
<i>J. bidentata</i> , β . minor, LEERS.	31	<i>J. dilatata</i> , ROTH.	6
<i>J. bidentata</i> , γ . globulifera, WEBER.	28	<i>J. divaricata</i> , SM.	12
<i>J. bifida</i> , SCHMID.	12	<i>J. Donniana</i>	9 39
<i>J. bifida</i> , SCHMID.	49	<i>J. emarginata</i>	10 28
<i>J. birostrata</i> 12		<i>J. epiphylla</i>	20 47
<i>J. Blasia</i> 20	82—84	<i>J. excisa</i>	11 9
<i>J. byssacea</i> 12	12	<i>J. exsecta</i>	14 19
<i>J. calyptrifolia</i> 18	43	<i>J. fissa</i> , SCOP.	11
<i>J. capitata</i> 12	80	<i>J. fissa</i> , SCOP.	79
<i>J. cavifolia</i> 18		<i>J. Flörkii</i> , WEBER, MOHR.	70
<i>J. ciliaris</i> 18	65	<i>J. fragilis</i> , ROTH.	62
<i>J. ciliaris</i> , WEIS.	36	<i>J. Francisci</i>	16 49
<i>J. cochleariformis</i> 15	68	<i>J. Funckii</i>	11

INDEX.

<i>J. furcata</i>	20	55, 56	<i>J. pusilla</i>	12	69
<i>J. furcata</i> . LEERS.....		73	<i>J. pygmæa</i> . WULF.....		69
<i>J. globulifera</i> . var. 1. ROTH.....		19	<i>J. quadridentata</i> . WULF.....		70
<i>J. globulifera</i> . POLL.....		28	<i>J. quinquedentata</i> . HUDS.....		70
<i>J. globulifera</i> . POLL.....		11	<i>J. radicans</i> . HOFFM.....		76
<i>J. globulifera</i> . ROTH.....		9	<i>J. reptans</i>	17	75
<i>J. gracilis</i> . SCHL.....		70	<i>J. resupinata</i>	14	23
<i>J. hamatifolia</i>	18	51	<i>J. resupinata</i> . SM.....		21
<i>J. heterophylla</i>	16	31	<i>J. rubiginosa</i> . NECK.....		6
<i>J. hibernica</i>	20	78	<i>J. rupicola</i> . SCHLEICH.....		44
<i>J. Hookeri</i>	8	54	<i>J. scalaris</i>	15	61
<i>J. Hutchinsiae</i>	19	1	<i>J. scalaris</i> . SCHM.....		79
<i>J. hyalina</i>	10	63	<i>J. serpyllifolia</i>	18	42
<i>J. incisa</i>	12	10	<i>J. serrata</i> . ROTH.....		14
<i>J. inflata</i>	11	38	<i>J. sertularioides</i> . LINN.....		8
<i>J. julacea</i>	8	2	<i>J. setacea</i>	7	8
<i>J. julacea</i> . Fl. Dan.....		3	<i>J. setiformis</i>	13	20
<i>J. juniperina</i>	8	4	<i>J. Sphagni</i>	10	33
<i>J. lævigata</i>	17	35	<i>J. sphærocarpa</i>	10	74
<i>J. lanceolata</i>	9	18	<i>J. sphærocephala</i> . ROTH.....		11
<i>J. lanceolata</i> . SM.....		61	<i>J. sphærocephala</i> . WEBER.....		79
<i>J. laxifolia</i>	8	59	<i>J. spinulosa</i>	9	14
<i>J. Leersii</i> . ROTH.....		65	<i>J. stipulacea</i>	16	41
<i>J. Lyellii</i>	20	77	<i>J. Tamarisci</i>	19	6
<i>J. Mackaii</i>	18	53	<i>J. tamariscifolia</i> . SCHREB.....		5
<i>J. macrorrhiza</i> . DICKS.....		27	<i>J. taxifolia</i>	14	
<i>J. minuta</i>	14	44	<i>J. Taylori</i>	15	57
<i>J. minutissima</i>	18	52	<i>J. tomentella</i>	18	36
<i>J. multifida</i>	19	45	<i>J. tomentosa</i> . HOFFM.....		73
<i>J. multiflora</i> . HUDS.....		8	<i>J. triangularis</i> . SCHL.....		76
<i>J. nemorea</i> . LINN.....		21	<i>J. Trichomanis</i>	16	79
<i>J. nemorosa</i>	13	21	<i>J. trichophylla</i>	7	7
<i>J. nigricans</i> . LAM.....		6	<i>J. trichophylla</i> . var. 3. ROTH.....		8
<i>J. obtusifolia</i>	14	26	<i>J. tridentata</i> . SCOP.....		70
<i>J. Orcadensis</i>	11	71	<i>J. trilobata</i>	17	76
<i>J. pallescens</i> . SCHRAD.....		62	<i>J. Turneri</i>	11	29
<i>J. palmata</i>	19		<i>J. umbrosa</i>	13	24
<i>J. pauciflora</i> . DICKS.....		8	<i>J. undulata</i>	13	22
<i>J. pinguis</i>	19	47	<i>J. varia</i> . LINN.....		25
<i>J. planifolia</i>	13	67	<i>J. ventricosa</i>	11	28
<i>J. platyphylla</i>	17	40	<i>J. viticulosa</i>	16	9
<i>J. polyanthos</i>	15	62	<i>J. viticulosa</i> β. WEBER.....		62
<i>J. pubescens</i>	20	73	<i>J. Woodsii</i>	18	66
<i>J. pulcherrima</i> . WEBER.....		65	<i>Mnium fissum</i> . LINN.....		79
<i>J. pumila</i>	9	17	<i>Mnium Jungermannia</i> . LINN.....		68
<i>J. purpurea</i> . SCOP.....		68	<i>Mnium Trichomanis</i> . LINN.....		79

